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ELECTRICAL REVIEW

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THE OLDEST ELECTRICAL PAPER • ESTABLISHED 1872 • VOL. CLI • NO. 3912

Fuel Research

THERE are few subjects that present so immediately profitable a field for applied research in electrical engineering as does the burning of coal—the predominating factor in power station capital, operation and maintenance charges. The range for investigation widens with the increasing deterioration in quality of coal which almost inevitably follows mechanized mining. In addition, the intention implicit in the national fuel policy is to allow no waste of any combustible matter—an intention which is illustrated by the proposals to use middlings and washery slurries for supplementary pit-head generation. In the face of this deterioration the electricity supply industry, for the large generating units necessary to meet the growing load, has to secure a boiler availability matching that of the steam turbine.

The chief problems in the use of fuel of this kind are due to the residue after combustion, the nature of which was discussed at the recent coal and ash conference of the Institute of Fuel. Ash is much more than a diluent of coal, adding to the cost of transport and introducing difficulties of disposal. It contains extraneous matter which, even in traces, is positive in its ill-effects, such as fouling of heating surfaces and corrosion of metal, which differ with the method of firing. On the other hand, from 5 to 10 per cent of ash is generally considered desirable to prevent burning of the fire bars, while 15 to 20 per cent has been found to give freedom from certain bonded deposits when the coal has a high chlorine content. The greatest obstacle to preliminary assessment of the behaviour at high combustion temperatures of the minerals mixed, but not distributed uniformly, in the coal is that they cannot by any known means be separated for analysis of their chemical compositions. Laboratory tests indicate only a probability, within unacceptably wide limits of error, of the kind of troubles to be expected from ash and its fusion to produce clinker, allied with the vaporization of minerals and chemical recombinations that take

place during incineration. Especially with regard to large boilers operated at high steam conditions the conference appeared to raise almost as many questions as it answered and confirmed the view that many problems can be solved only by tests under actual working conditions. The new price structure of the National Coal Board was a big step forward, but it is apparent that it cannot be regarded as more than a temporary settlement of the value of low grade coals.

ENGINEERING WAGES

Upon the whole the leaders of the engineering trade unions must be well satisfied with the result of the protracted discussions on their claim for increased wages. They knew from the beginning that the demand for £2 a week which they were instructed to make was unrealistic and they were also reluctant to seek to enforce a claim for less by imposing a ban on piecework and overtime. Present trends in home and export trade do not warrant any addition to costs and the conceding of an increase of 7s 4d a week by the employers in the engineering industry can only be justified by improved efficiency.

TRANSPORT POLICY

In his recent paper to the Municipal Passenger Transport Association Mr. J. E. Frith posed the question "Why has the trolley-bus become less popular with operators?" An important factor has undoubtedly been the post-war preference for motor-buses of London Transport — controlling the largest system of its kind in the world—which has influenced others in the same direction. It is therefore particularly noteworthy that a number of trolley-bus routes in the south-western suburbs are being re-equipped for a further lease of life. For twenty-one years they have provided an efficient service in some of the busiest suburban areas, including Wimbledon, Kingston, Hampton Court and Twickenham. The fact that only in 1948 were the pioneer vehicles introduced by the former London United Tramways replaced, bears out the contention of Mr. Frith that the trolley-bus can be assumed to have a 25 per cent longer life than its internal-combustion counterpart.

SEPARATISM

One brief passage in the Queen's Speech to Parliament mentioned that the question of the supply of electricity in Scotland was "being attentively examined with a view to legislation." This appears to be the outcome of a nationalist demand for the separation of Scottish electricity from the English system. This may or may not be desirable but it is very probable that any measure would cause trouble in Scotland itself. The North of Scotland Hydro-Electric Board would not wish to be submerged in an all-Scotland board and the two southern Electricity Boards would not easily submit to domination by the Hydro Board. Apart from this there is the possibility that Glasgow and Edinburgh might not run easily in double harness. It will be interesting in due course to have the results of the "attentive examination."

UNDUE PREFERENCE

Section 19 of the Government's new Transport Bill appears to relieve the railways from their obligation not to accord undue preference in the matter of charges to "persons, companies or descriptions of traffic." Subject to explanations, which will no doubt be made in further Parliamentary proceedings, this seems to infringe a principle embodied in the Acts governing public services. It was applied long before nationalization and it is still operative in, for instance, electricity supply. There are possibly occasions on which the Electricity Boards could wish for freedom from this restriction, to secure desirable loads.

Modern Varnishing Practice

Outline of Plant and Processing

By

S. F. PHILPOTT,

M.I.E.E.

ONE of the most important processes in the manufacture of electrical machinery and apparatus is the impregnation of their windings with insulating varnish. The length of service which a machine will give depends to a considerable extent on the varnishing operation.

Most of the insulation materials used in armature and coil windings are of a fibrous nature. They contain air cells which absorb and become filled with moisture extracted from the atmosphere and such dampness greatly reduces their insulation value. Under normal conditions silk, cotton and other similar materials "in the white" contain water to the extent of about 10 per cent of their volume.

The impregnating process consists in removing the moisture and then filling the interstices with a solid insulating material, introduced in the form of a liquid varnish and dried out under heat. For this purpose the desirable properties of an insulating varnish are:—

(1) Adequate dielectric strength in all circumstances.

(2) High resistance to moisture; the object of varnishing would be defeated if the varnish itself were moisture absorbent.

(3) It must not be affected by oil, grease, carbon dust and dirt encountered under the normal operating conditions of the machine.

(4) Good penetration. When used in the prescribed manner the varnish should penetrate right to the centre of the coil while the solvent should evaporate completely and rapidly when dried under heat. Good penetration must not be obtained at the expense of adequate "body" otherwise the air spaces will not be filled.

(5) In addition to its insulating properties, the varnish must have good cementing powers. Besides acting as an insulator another function of the varnish is to hold the wires of the winding together and prevent displacement. Movement would cause abrasion of existing insulation. Many modern machines run at very high speeds, so creating considerable centrifugal force which tends to move the conductors.

(6) The varnish must be sufficiently flexible to allow for the expansion and contraction of the winding with normal changes of working temperature, and the slight conductor movement which takes place at starting and stopping.

(7) The insulating and other properties must be maintained throughout the working life of the machine and must not be affected by temperature. For many years the maximum temperature rise which could be tolerated in any winding was about 50 deg C and there was no difficulty in operating oil base varnishes under such conditions. The limiting factor was deterioration of the textile insulating materials which occurred when the working temperature was raised much above this limit. The introduction of glass insulation for wires, slot liners, etc., made it possible to build machines capable of continuous operation at 150 to 200 deg C, with a consequent decrease of size and cost, so the insulation varnish became the limiting factor. This led to the development of varnishes suitable for high temperatures.

(8) It should be reasonably low in cost and speedy in use. All varnishes are relatively expensive and must be used economically. Overall times for varnishing vary with different types of varnish and the size and construction of the armature, or other winding, being treated. A time cycle of 12 to 18 hours is not uncommon for oil base varnishes.

(9) When a machine is to be used under tropical conditions, the insulation varnish must be capable of protecting the windings and their supporting metal work from the effects of high humidity and high temperatures, and preferably also against the growth of fungus.

(10) Considerable importance is attached to the appearance of a finished machine and its component parts; therefore an insulation varnish should dry smoothly without blobs and be of a pleasing colour. Sometimes separate finishing varnish is applied for this purpose, but it is obviously more economical if the impregnating varnish also gives a good finish. In this connection it may be remembered that the functions of impregnating and finishing varnishes are opposite. The former must penetrate into the windings, whereas the latter must remain on the outside.

(11) The varnish should not have any deleterious effect on the insulation of the wire or other parts. In practice certain varnishes tend to soften, or destroy, the covering of ordinary oil-based enamelled wires, and this point must be watched when selecting an insulating varnish for use with such wires. Synthetic wire coverings are not so readily attacked.

Use of Shellac

In the early days of electrical engineering a varnish made of shellac dissolved in alcohol was brushed on the windings laver by layer. The alcohol evaporated naturally, leaving the insulation "impregnated," or coated, with shellac. Another method when little or no heat was involved was to immerse the complete coil in molten paraffin wax, which penetrated the windings and solidified on cooling.

Although these treatments were sound in principle and correspond to those used to-day, they were not good in practice and many special insulating varnishes were developed, consisting mainly of gums, drying oils, agents to accelerate the drying, and solvents. These were known as drying-oil base varnishes and they are still very largely used for the impregnation of windings for operating under conditions which are not particularly severe, or when adequate time can be allowed for processing. However, the increasingly arduous conditions under which many types of apparatus are required to operate to-day, the availability of newer insulating materials, the need for speedier processing and the natural development of the varnish industry itself have brought forth new varnishes and fresh ways of applying them.

In order that the significance of these various developments may be fully appreciated it is proposed to describe briefly what may be termed the basic process of varnishing when using *natural* resin varnishes as has been practised for many years.

There are usually four stages. The first is to get rid of the moisture contained in the winding when it comes from the winding department for impregnation. This is done by placing the armature, or whatever it may be, in an oven for some hours at a temperature above the boiling point of water (110–120 deg C usually). Then the winding is taken from the oven and dipped bodily, rather slowly, into the insulating varnish and left immersed usually for about fifteen minutes (in the case of small and medium armatures) or until air bubbles cease to rise, allowing the varnish to percolate right through the winding.

It is then raised from the varnish tank and allowed to drain, after which it is placed in a heated and well-ventilated oven, where it remains for at least eight hours to ensure complete evaporation of the solvent. The oil base varnish oxidizes under heat and it is essential that the oven be well ventilated to carry off the solvents and to ensure proper oxidation. The baking process consists of two distinct steps: (*a*) evaporating the solvent and (*b*) oxidizing the gum-oil constituent. Obviously the evaporation must be complete before an oxide skin is formed.

The above represents the dryout-dip-and-bake process. Penetration takes place by capillary action and by the pressure exerted by the weight of the varnish. The total time taken ranges from 10 to 12 hours and the process is, or may be, "messy."

Synthetic Resins

The development of synthetic resins was important to the electrical industry in many ways, not least in their application to varnish manufacture; a whole range of synthetic resin varnishes has been made available which are superior to the natural resin, or gum, types in respect of their resistance to moisture, acids, alkalis and oils. They have greater bonding properties than the other type and are therefore particularly suitable for high-speed armatures.

Natural resin and bitumen oil base varnishes attain their insulating properties by oxidation brought about by slow drying in air. Synthetic resin varnishes are entirely different in that they change their form through polymerization and, when that action is complete, the residue becomes infusible and insoluble. Because of this action, synthetic varnishes are particularly good for deep windings where it is sometimes difficult to effect complete oxidation with the natural resin material.

Like their older counterparts, synthetic varnishes are available either in a natural brown colour, or black, but whereas the colour of the natural resin varnish is due to the use of either gum or bitumen as the main constituent (golden or black respectively), in the case of synthetic varnish the black colour results from the addition of pigment and there is not the same difference in properties between the brown and black

varieties. Synthetic varnishes are used in a similar manner to the natural resin type.

Although not essential, two temperature stages are desirable in drying: first 80 deg C or so maintained for about two hours to drive out the solvents before polymerization takes place, followed by the main stoving at 130–150 deg C when polymerization and solidification occur. The final baking temperature of synthetic varnishes is generally higher than that for natural resin varnishes.

The baking times are also shorter than for natural varnishes and development has inclined towards a still shorter baking time which not only reduces the cost of heating but permits a more regular flow of finished windings.

Cold Dipping

The processes so far described have followed the basic idea of first removing all the original moisture from the windings by heating them "in the white" for some hours and then transferring them, while still hot, to the varnish.

In order to obviate this first process and so reduce time and cost, the process known as cold dipping has been evolved, by which the windings are impregnated cold in the condition in which they come from the winding shop. This procedure is made possible by the development of varnishes containing a water carrying solvent. The moisture is taken up from the coil by the solvent and is thrown off during the baking operation.

The windings require a longer period of immersion than is necessary with normal varnishes ($\frac{1}{2}$ to $\frac{3}{4}$ hour) but because of the time saved in preliminary drying and the fact that the varnish itself is quick setting, the cold dip process reduces the overall time considerably. Furthermore, tests show that the final dielectric strength may be greater than with processes employing a preliminary dryout "in the white"

This point is illustrated by the curves in Fig. 1, the heavy line representing the variation of the insulation resistance through the various stages of impregnation of a winding dipped in a normal synthetic varnish. The broken line, conveying similar information for a winding impregnated by the cold dip process, indicates that the final insulation resistance (while hot) is approximately 150 megohms against 50 megohms for the windings treated by the hormal method.

Solventless Varnishes

In the case of both natural gum and synthetic resin varnishes, the solid matter which is injected into the winding is first dissolved in a solvent, which is subsequently evaporated during the drying process. It is evident that removal of the solvent will leave voids depending on the amount of solids in the varnish. The general run of oil base and synthetic varnishes contain from 50 per cent to 85 per cent of solids. The rest is solvent.

The kind of solvent used differs with the make and variety of varnish: some types are very liable to attack, soften and destroy the insulation of enamelled wires, as are widely used for field coils of small motors, relay coils, instrument windings, etc.

To overcome the above objections "solventless" varnishes have been evolved which contain 100 per cent non-volatile matter. They consist of a mixture of synthetic resins which, on being catalyzed and/or heated, react together to form an infusible solid. Solventless varnishes are preferably applied by the dryout-dip-and-bake method.

The general process and treatment times

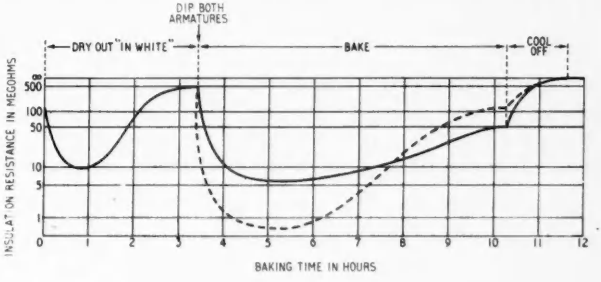


Fig. 1.—Effect of baking time on insulation resistance of two similar armatures impregnated by cold dipping (full curve) and by dryout-dip-bake process (dotted curve)

are similar to those for the solvent varnishes. The greater solidity of the finished windings improves the heat conductivity and solventless treated coils will function at a lower working temperature than when treated in the more orthodox way. The solventless varnish has a low surface tension. Penetration is in consequence good, as also is the appearance when finished.

The solventless varnishes represent a considerable improvement upon the bitumen type of impregnating "compounds" which have been used in the past when a solidly impregnated job has been called for. In practice compound impregnation has been mainly confined to field coils, particularly those of traction motors. Unlike compounds, solventless varnishes do not re-soften with heat. Because of their greater solid/solvent ratio solventless varnishes are naturally more expensive than the oil base or synthetic types.

Types for High Temperatures

It has already been mentioned that the development of glass insulation for wires, slot liners, etc., has made it possible for electrical machines to be built for continuous operation at temperatures of 150–200 deg C against the 60–70 deg C which is generally considered the safe maximum for those insulated with silk, cotton and other organic materials.

The electrical life of any machine depends upon the resistance of its insulation to ageing, which is a function of temperature and time. Normal insulating varnishes, such as those described earlier in this article, while being entirely satisfactory for continuous operation in the region of 70 deg C, are known to age rapidly at temperatures at which glass insulation will function comfortably. This fact led to the development of varnishes suitable for high temperature operation. One result was the discovery of an entirely new class of insulating materials known as the silicones which have found a wide sphere of application in insulating problems in addition to the impregnation of complete windings.

The ultimate sources of silicones are sand, brine, coal and oil, from which are formed organo-silicon compounds in which silicon takes the place of carbon in certain parts of the molecule.

The silicone varnishes are of good dielectric strength and, besides their essential quality of stability at high temperatures, are extremely resistant to moisture and chemical action. They are therefore valuable in machines where working conditions are severe, even though the working temperatures are not necessarily abnormal.

Silicone varnishes are at present more expensive than the resin varnishes and their commercial use is restricted mainly to applications where minimum machine weight is required, as for example in aircraft; or where size is of importance, as when a motor is to be substituted for one of smaller horse power without taking more space; or to motors where small weight and bad service conditions have both to be contended with, as in traction motors.

Like most other varnishes, the silicone types consist of solid matter in a solvent which is evaporated by heat. Two classes are made: one containing 70 per cent of solids requiring a curing temperature of 230–260 deg C while the other contains 50 per cent of solids and requires an ultimate curing temperature of 150 deg C. The advantage of the second type is that the curing temperature can be obtained in a standard oven as used for low-temperature varnishes, whereas a special oven is usually necessary to provide the higher baking temperature for the first type.

In both cases a preliminary baking period at lower temperatures to remove the solvent is necessary. The general process, baking times, etc., follow those of normal dryout-dip-and-bake varnishes though some slight modifications are recommended in certain cases.

Developments have also taken place in synthetic resin base varnishes adapted for high temperature operation, and several are available which can be used at temperatures of the order of 150 deg to 200 deg C in conjunction with glass fibre insulation.

Tropical Conditions

Electrical development in the tropics generally, accentuated by wartime experience, has led to the development of special varnishes and techniques to ensure that electrical apparatus will function under conditions of extreme humidity and temperature without failure of insulation or the growth of mould. This subject is one of some complexity and each case must be considered individually and with due regard for insulation procedure and tests laid down by the customer.

Generally tropical insulation procedure consists in using a good synthetic resin varnish, vacuum impregnation and in giving the windings, indeed the whole of the interior of the machine, a coating of special fungus-resisting finishing varnish, which is usually brushed or sprayed on.

The developments described have naturally called for modification of the methods of applying them. The newer materials, with their higher temperatures, shorter baking times and other characteristics, require greater care in their storage and more scientific control of their use, while the need to minimize cost has led to considerable development in plant, particularly for mass production.

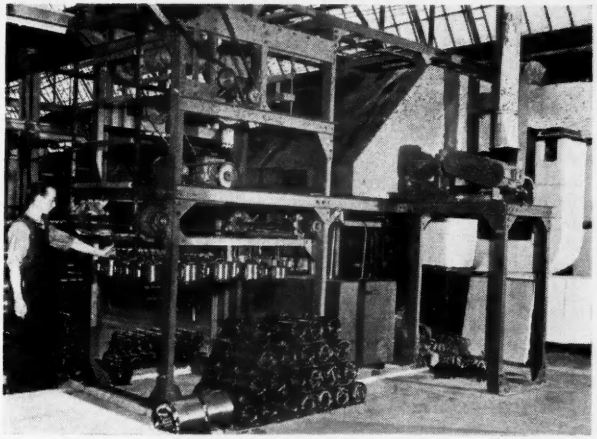


Fig. 2.—Canopy oven in which heated air is continuously circulated by a motor driven fan

Simple box type ovens for the drying out and baking of windings may be heated by steam, electricity or gas, and they may be double cased with a packing of heat insulating material between the casings; for gas heating they are treble cased so that the flame is outside the chamber containing the work.

The ovens invariably have adjustable ventilators with means of temperature regulation. The latter is usually done automatically by thermostatic control and as a check a temperature recorder is desirable, particularly if the oven is unattended at night, in which case a time switch may also be used to shut off the heat when the correct drying time has elapsed.

The box type oven depends on natural convection for the circulation of the hot air within it. Improved results are obtained by fitting the oven with a forced air circulating fan or blower. The advantages are: (1) larger volume of air in circulation; (2) quicker heating of the work and removal of the volatiles while storing is considerably reduced; (3) even temperature over the whole volume of the oven and avoidance of hot and cold spots due to proximity of heaters and ventilating ducts respectively; and (4) the ovens can be more densely loaded as the work does not restrict the air flow.

In a typical construction the heater is outside the oven proper, the hot air being forced by a motor driven centrifugal fan down a cavity surrounding the work chamber, thence to the interior of the oven through openings at the bottom, after which it is directed back to the input end of the heater, re-heated and re-circulated.

The working chamber is fitted with a ventilator and provision is made in the circulating system for the introduction of a certain amount of air to compensate for that withdrawn from the system.

The loading and unloading of box type ovens takes a fair amount of time and considerable heat is lost when the doors are open; further, a fairly long time is required to complete the whole process and a time cycle of as much as 12 hours or more may elapse between placing the windings in the first drying oven and receiving them from the final stove. This generally means overnight stoving with its disadvantages of lack of skilled supervision and release of a large batch of windings each morning, which tends to upset the even flow of work in those departments which do the turning, balancing, testing and assembly after varnishing.

Modern practice for mass production is to use some form of conveyor oven and one

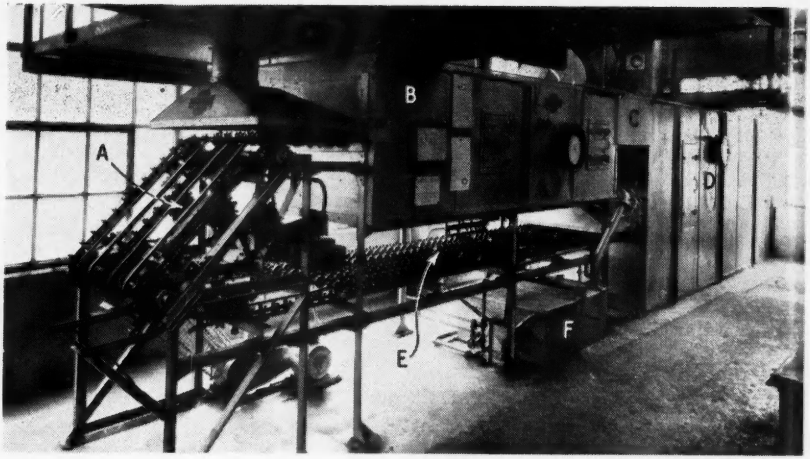


Fig. 3.—Typical Zanderoll varnishing plant

of the major problems of design is so to arrange the conveyor that the work enters and leaves the heated chamber without perceptible heat loss.

One method is to pass the work through a canopy oven (Fig. 2) in which heated air is circulated continuously by a motor driven centrifugal fan. The inlet and outlet are both at the bottom and as hot air always rises, any introduced into the chamber will rise and tend not to escape. Thus it is possible to pass the work through the oven while maintaining an effective seal for the heat.

Disposal of evaporated solvent from the oven is by an auxiliary fan which removes the fumes while the work ascends into the oven, and introduces fresh air into the system. The temperature is thermostatically controlled.

The work is carried on a motor driven chain conveyor and first passes through a vat of varnish. Then it travels along an open length to allow for draining before passing through the heat seal into the oven. It goes up one side of the " hump " of the oven, thence along the top, down the other side and out to the unloading point.

The Zanderoll conveyor process reduces the cycle time to less than two hours and delivers finished armatures in a steady flow. The process combines the advantages of synthetic varnishes, radiant heating and flow production. The armatures, or stators, progress steadily on the conveyor from one end of the plant to the other, the two ends being adjacent so that a single operator loads and unloads the conveyor, all the operations being automatic. The armatures and stators are so arranged on the conveyor that they rotate slowly all through the process, every portion of each unit receiving the same amount of heat radiation.

The design of the plant varies according to circumstances; in a typical installation the items being treated are conveyed first through a forming and preheating section, then while still on the conveyor, and still rotating, they are lowered into a varnish tank. The amount of immersion is carefully controlled so that the shafts of armatures and bores of stators are not immersed. This avoids the tedious cleaning operation which is necessary when the parts are fully dipped. Rotation of the parts ensures that the whole of the winding receives its quota of varnish.

The varnish itself is specially constituted so that the greater part of the solvent is driven off as soon as penetration of the heated winding takes place and the winding is substantially solvent free as it traverses through the baking tunnel. The heating of this portion is graded to suit the characteristics of the varnish.

Dependent upon the schedule employed, the armature is either removed from the plant at the end of the baking process, or is

given a further dip and bake before reaching the unloading point.

The combination of the conveyor method with an improved heating system and fast drying varnish enables the processing time to be reduced to a fraction of that taken by orthodox methods. The plant is compact—it is usually built in tiers to reduce floor space—and it is clean and tidy.

Overall times vary with the size of object being treated. Fractional h.p. motor armatures take from one to two hours to complete the cycle and the conveyor speed is such that several hundred armatures may, if necessary, be treated in an hour. It is frequently possible to put two or more windings side by side on the conveyor, thus materially increasing the output.

Fig. 3 shows a typical Zanderoll plant. The armatures are fed on to the inclined portion A of the conveyor, four side by side, and pass through the preheating section of the oven B, thence through the dipping section C, through the drying oven D and return below the oven as shown at E.

Fig. 4 is a close view of the loading and unloading point and Fig. 5 is the dipping section. The armatures emerge from the drying section on the left and, following the decline in the guide tracks A, pass through the varnish B. The guide tracks then rise again at C and the armatures pass into the drying section D. The varnish in the dipping tank is maintained at a constant level and is kept in circulation by a pump. The main storage tank is below the plant and can be seen at F on the floor of Fig. 3.

The only rival to the simple dip process is vacuum impregnation in which the drying out and baking operations remain unaltered but instead of the windings being dipped in an open tank of varnish they are placed in an airtight chamber which is subsequently filled with varnish under pressure. After a suitable period the varnish is withdrawn and the air exhausted from the chamber, wherein the windings are allowed to drain. This method results in good penetration and good draining.

The relative merits of the two systems have been the subject of discussion for many years. The questions at issue would appear to be: Does the pressure-vacuum system give better results than the simple dip? If so, is the improvement such as to warrant the considerable outlay required for the vacuum plant, compared with the very simple equipment of the other method? These points are outside the scope of this article.

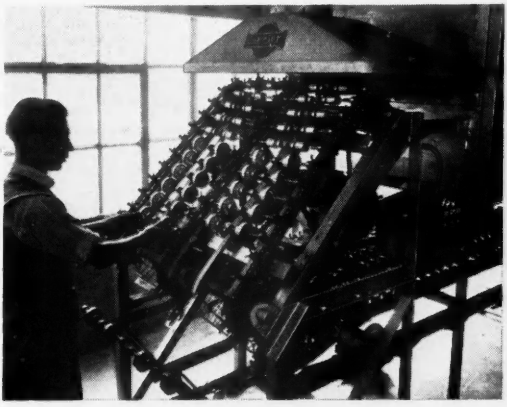
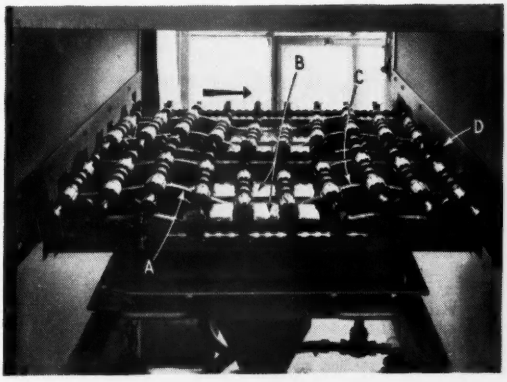


Fig. 4.—Loading and unloading point of the plant illustrated in Fig. 3

Fig. 5.—Dipping section of the Zanderoll oven illustrated in Fig. 2



A modern vacuum impregnation plant is illustrated in Fig. 6 in which A is the impregnating tank, which is electrically heated to prevent condensation of moisture from the vessel and cover, and also to reduce the viscosity of the varnish. The temperature is thermostatically controlled. The storage tank B is similarly heated and temperature controlled as is also the transfer pipe between the two. In this particular installation the storage vessel is fitted with a motor driven mixer gear for use when resinous compounds are employed. Varnishes, as generally employed, require mixing only when "thinners" are added. The plant is fitted with two vacuum pumps: a high vacuum type C which will exhaust to 0–1 mm Hg and a low vacuum pump D (28in Hg) which also acts as a compressor with a pressure of up to 80 lb/sq in.

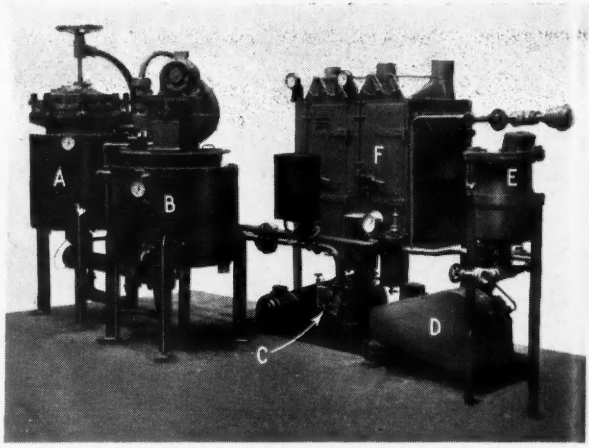


Fig. 6.—Modern vacuum impregnating plant

The compressed air is dried and filtered before entering the impregnator through the silica-gel trap E. A condenser (hidden by the storage tanks) is fitted in the vacuum line to condense the evaporated solvent and prevent it from entering the pumps. The treated windings are generally removed from the impregnator for drying.

The writer is indebted to the following firms for assistance in preparing this article:—Albright & Wilson, Ltd., silicones; Controlled Heat & Air, Ltd. (photograph of canopy oven); General Engineering Co. (Radcliffe), Ltd., vacuum impregnation; Griffiths Bros. & Co., Ltd., varnishes; Hoover, Ltd., for photographs of the Zanderoll plant in operation; and the Sterling Varnish Co., Ltd., varnishes and the Zanderoll process.

Indian Telephone Manufacture

AN account is given in *Indian Trade and Industry* of the operations of Indian Telephone Industries, Ltd., which has made India largely self-sufficient in telephone equipment. The company was formed in January, 1950, the shares being held as to 83 per cent by the Government of India, 14 per cent by the Mysore Government and the remaining 3 per cent by the Automatic Telephone & Electric Co., Ltd., Liverpool. The latter company, which nominates one of the directors, has a 15-year agreement with the Indian Government by which it provides technical experience and assistance to the Indian company.

The works is situated near the Krishnarajapuram railway station on the old Madras trunk road, six miles from Bangalore City. Apart from the works and administrative buildings there is to be a township, Duravani Nagar ("Telephone City"). Power to the extent of 1,000 kVA is supplied by the Mysore Government.

Mass manufacture based on production control has been adopted. Besides assembling telephones and manufacturing parts, the factory produces a great deal of auxiliary equipment. At present there are 1,647 employees including 10 European technicians provided by the A.T. & E. Co. The value of the average monthly output is Rs. 8 crores (£58,000), the main customers being the Posts and Telegraphs Department and the railways.

ELECTRICITY IN THE AREAS

House Service Charges : Reinforcement in Glasgow

S.E. SCOTLAND

THE policy of the S.E. Scotland Electricity Board in the matter of charges for service connections to houses is explained in the Board's annual report for 1951–52. From vesting day to March last the practice of the former electricity undertakings was followed and in a large part of the Area underground cable on private property was charged for at 10s a yd and overhead line at 5s (these charges were generally waived in the case of all-electric houses). In the remainder of the Area a service charge was levied only if the amount of cable exceeded a specified length. Since then, because of the considerable increase in the cost of service connections—now amounting in many instances to £50 or more a house—the Board has asked all owners to pay £10 for underground and £5 for overhead services, with additional charges for those of more than 10 yd.

Comment is made on the reduced rate of expansion in sales. Although the number of consumers increased by 16,204, sales expanded by only 6·6 per cent, less than half the 1950–51 rate. The falling off was particularly noticeable in domestic supplies. More encouraging was the trend of electricity consumption on farms, which rose by nearly 30 per cent, mainly because existing agricultural consumers made greater use of the service (214 additional farms were connected during the year).

The off-peak use of electricity has received special attention. Tests are being carried out in conjunction with the B.E.A. Research Department in two large buildings which are to be heated by electrical floor warming methods, while the behaviour of various kinds of floor covering is also being studied.

The Board's accounts show a net deficit of £113,630 without allowing for a £107,000 contribution to taxation reserve. After bringing in a balance of £107,670 from last year, general reserves have had to be drawn on to the extent of £112,960.

S.W. SCOTLAND

The year's trading of the South West Scotland Electricity Board resulted in a deficit of £482,067, mainly because of a rise from £8,001,919 to £9,422,289 in the cost of electricity purchased. A sum of £138,150 was received from the B.E.A.'s central reserve fund in reduction of the deficiency.

Standard industrial and commercial tariffs introduced last December and March, respectively, were designed to bring in additional revenue to meet rising costs, while the domestic and farm tariffs (already standardized) and the public lighting rate were revised after the close of the year under review.

In 1951-52 the average price received per kWh sold was 1·12d; this compares with 0·83d in 1938-39. By contrast the report shows, for example, that lead covered and armoured l.v. underground cable, which cost 8s 10d a yd in 1939, had risen to 41s 7d last March; l.c. and a. service cable had gone up from 1s 5d to 6s 5d a yd and 100 kVA transformers now cost £263 against £103.

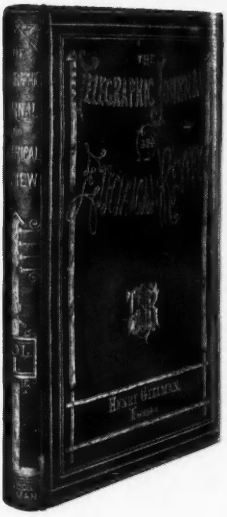
The report records that work to the value of £2,455,193 was carried out last year on major reinforcement schemes and general system development. Associated with the South Glasgow reinforcement scheme, arrangements were made for the establishment of an additional main substation and extensive modifications to the 6·6 kV network at a cost of £119,536.

A summary of progress since vesting date shows that 96,000 new consumers have been connected (21,131 last year); all but 6,580 of the 350,000 consumers previously served at non-standard voltages now receive a standard supply; 17,523 of the 24,103 d.c. services have been changed to a.c.; and the number of uncertified meters has been reduced from 302,662 to 73,840.

During the past year the Board entered into an arrangement with the Scottish Gas Board for collecting gas accounts at the Rutherglen Service Centre.

Eighty Years Ago

High Lights in Our First Issue



The cover of Vol. 1 of the *Telegraphic Journal and Electrical Review* indulged in symbolic fantasy

IT was on 15th November, 1872, eighty years ago to-morrow, that this journal made its first appearance as the *Telegraphic Journal and Monthly Illustrated Review of Electrical Science*. The subsidiary title was abbreviated to *Electrical Review* in the third issue and after growing in type size step by step this eventually superseded the original main title.

The first words addressed by the editor to the readers of the first issue were:—"We need not dwell upon the importance of the applications of electricity" and there followed a reference to the "chief branch—Telegraphy, a science itself."

Readers were promised "leading articles from the pens of those accustomed to weigh questions of commercial science" and "original papers contributed by eminent Electricians and Scientists whose names will be sufficient recommendation of the high tone of this section." Other features were to be abstracts of the proceedings of scientific societies; reviews of scientific books "conducted in the impartial manner intended to characterise the Journal"; share lists and city notes to "form a guide to the Investor interested in the commercial progress of the science or any particular subject" and to be conducted "with the greatest rigour and accuracy"; and a students' column comprising articles "from the pens of Foreign and English Authors celebrated for their didactic work."

The editor, the Rev. William Higgs, M.A., then affirmed:—

> "This is our programme. Experience may prove modification to be desirable, and we shall gladly profit by the teachings of experience. But there will be no change in, or modification of, the tone of the Journal, or the determination to overcome any opposition that may present itself."

Looking through the pages of this number we find that the very first article deals with nationalization—the State acquisition of the telegraphic system. It was agreed that the service had become cheaper, but although the "electric force" appeared to be as quick and willing as ever the length of time taken to transmit a message was "too often reckoned in hours instead of minutes." "The speed is a marvellous triumph of science; the delay is a created obstruction of routine."

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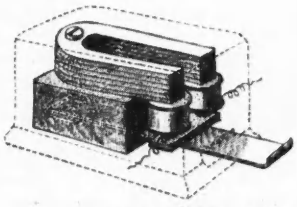


cracked; or they may be exposed to the heat ra
from hot-air or water-pipes or other source of wa

Sir Charles Wheatstone's counting device as illustrated in our first number

application of magneto-electricity" by Sir Charles Wheatstone. It was a device for registering at a distance the periodical motions of a machine, etc. A permanent magnet, two cored and wound bobbins and an armature were arranged to give a small induced current upon the movement of the armature by the operation of the machine or whatever was being dealt with. These currents were transmitted to an indicator and recording device.

A survey by Sir James Anderson of the world's submarine cables laid between 1850 and 1871 showed that there were 213 of them with a total length of 45,783½ miles. Sir James described many of the troubles encountered in the laying and operation of these cables.

Latimer Clark, M.I.C.E., contributed an abstract of a paper read by him before the Royal Society on "A Voltaic Standard of Electro-Motive Force." In this the author detailed his work on the mercury-zinc cell which was later used as an international standard of electromotive force, bearing the inventor's name.

Another invention described was a thermo-electric pile produced by Mure and Clamond. This comprised iron and galena elements and the largest size had 560 couples "with an intensity equivalent to that of 60 Daniell elements." Details and an illustration of an ingenious electro-magnetic racking device for operating the carbons in an arc lamp (Duboscq's regulator) were also given.

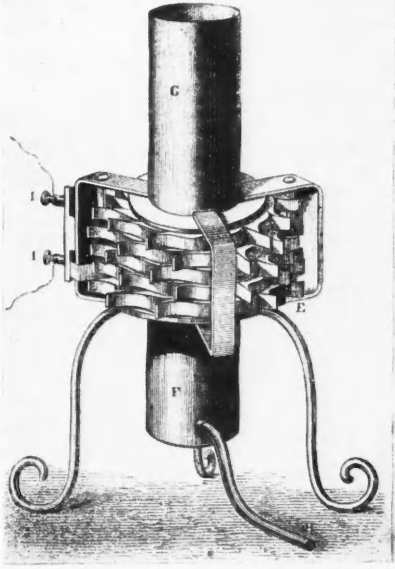
In the "City Notes" was an announcement of a banquet at the Cannon Street Hotel to celebrate the opening of telegraphic communication with Australia when a wire was to be taken into the room for an interchange of messages with similar gatherings in Melbourne, Adelaide, Sydney and Brisbane. (An oblique reference in the next issue indicates that success was achieved.)

Among the advertisers in this first issue was the India Rubber, Gutta Percha and Telegraph Works Co., Ltd., which offered vulcanized india rubber, ebonite, gutta percha, and telegraph instruments. The British Telegraph Manufactory advertised magneto-electric counters and magneto-electric bells; insulated electrical wires ("conductivity guaranteed 90 per cent") were announced by J. & W. Rickard, Derby; "magic and phantasmagoria lanterns" by John Browning: while John Faulkner, Manchester, advertised lightning conductors, electric coal-pit signal bells and "the repair of church steeples and mill chimneys." A number of publishers, among them Lockwood & Co. and Longmans Green & Co., announced scientific works, the authors including such well-known men as J. Clerk Maxwell, William Crookes and John Tyndall.

For sixpence the reader received eighteen pages (6½in by 9½in) of editorial matter and this was at a time when sixpence was worth immeasurably more than it is now (sixpence was then the standard rate of income tax). To-day the journal offers between fifty and sixty pages for a shilling considerably diminished in value.

the gas is admitted, and by the central opening the air.

FIG. 6.



The elaborate thermo-electric pile of Messrs. Mure and Clamond

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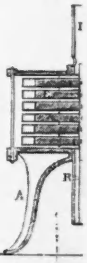

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Large Drying Oven

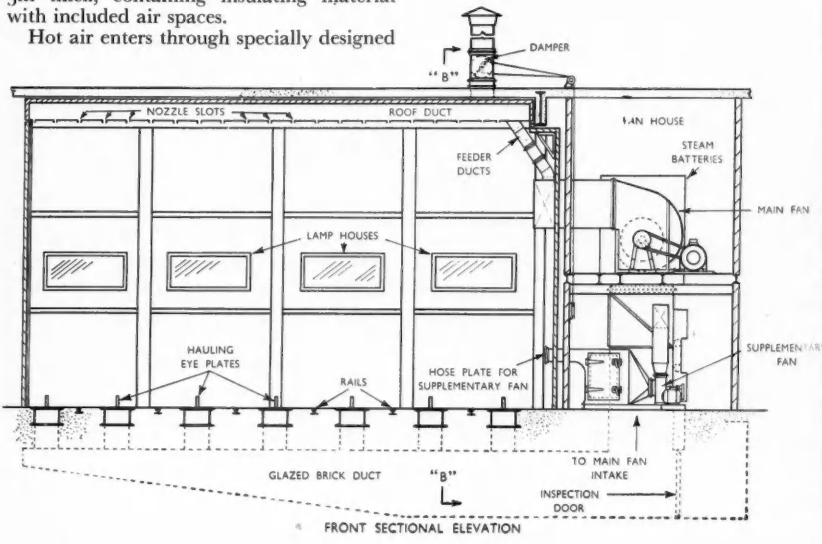
Capacity for 100 MVA and Larger Transformers

As part of its programme of extensions to meet the increasing demand for power transformers the General Electric Co., Ltd., has installed in its Witton works a new drying oven which is capable of dealing with transformers of 100 MVA and above. The heating facilities were designed for an estimated weight of 180 tons of metal in the transformer itself, with additional allowance of 30 tons for the oil, while it was decided that controlled temperatures from 90 deg C to 120 deg C were to be attainable. It was considered that these requirements could best be satisfied by a system of circulating heated air.

The oven has a volume of over 13,000 cu ft; it is 17ft 8in high, 33ft wide and 23ft deep, the mouth width being 31ft 9in. A steel framing with panel brickwork forms the outer shell and inside this, but having no metallic contact with the outer steelwork, is a second shell consisting of steel boxes, 3in thick, containing insulating material with included air spaces.

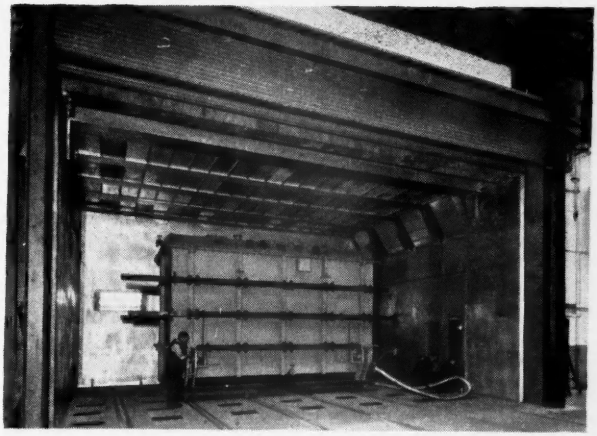
Hot air enters through specially designed nozzle slots in the bottom faces of four aluminium ducts built into the roof and extending the full width of the oven. The air is supplied to these ducts by the main fan, installed in a fan house alongside the oven, through feeder ducts. Having passed down through the oven, the air leaves through grids in the top plates of seven steel boxes which are set in the floor. These boxes extend from the front to the rear of the oven and discharge at the back into a glazed brick duct, through which the air is conducted to the intake of the main fan. The sides and ends of the boxes are covered with a layer of plastic asbestos to allow for expansion and the space between them is filled with heat resisting cement.

Clamped to the floor between the boxes, and accurately set for level and gauge, are steel rails on which move the six-wheeled bogies carrying the transformer. To assist in moving the transformer into the oven, hauling plates, or "deadmen," are set in



FRONT SECTIONAL ELEVATION

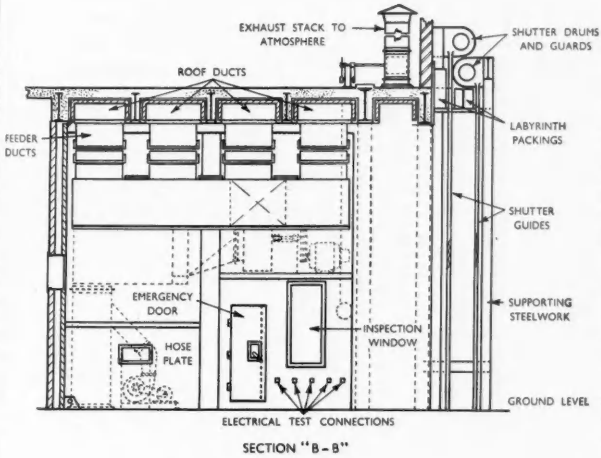
the shop floor between the rails at the front of the oven so that towing wires may be arranged as required. These "deadmen" are set below the shop floor level and are covered with steel plates when not in use. In addition, hauling eyeplates are set in the angle between the rear wall and the floor for the attachment of blocks necessary for pulling large transformers into the oven.



General view of the oven with a large unit being prepared for drying

The oven is closed by a door consisting of two roller shutters which are separated by a 20in air space. At the top of the shutters this space is filled by specially designed labyrinth packings and similar packings are fitted between the inner shutter and the wall. This electrically operated double door is controlled by a switch fitted with a "deadman's handle." The shutters are electrically interlocked so that when the door is being raised the inner shutter begins to rise before the outer shutter. This ensures that nobody can inadvertently touch the hot inner shutter; the outer shutter is very little above the normal shop temperature.

The fan house has two floors. On the upper floor is the main fan which can supply four complete changes of air per hour. The air circulates repeatedly in the closed system but additional air can be injected if required, in which case the displaced air is discharged through a ventilator above the roof. In its downward passage through the oven the circulating air carries with it through grids in the floor any dust which may be present in the air. This is removed by a filter in the intake to the main fan.



SECTION "B-B"

On the opposite page and above are the front and side elevations showing the main constructional features

Before entering the main fan the circulating air is heated by two steam batteries. The primary battery supplies the heat necessary to compensate

for normal losses from the oven shell, while the secondary battery is used to control the oven temperature. The steam supply to the secondary battery is regulated by a controller by which the temperature of the transformer can be maintained at any temperature between 90 deg C and 120 deg C.

On the lower floor of the fan house there is a supplementary fan connected to the transformer tank by metallic hoses. It draws air from the tank and so ensures intimate contact between the hot air and the transformer windings. A vacuum pump is also provided so that when the normal heating operations have been completed the transformer tank may be sealed and exhausted and the transformer subjected to vacuum drying and oil impregnation.

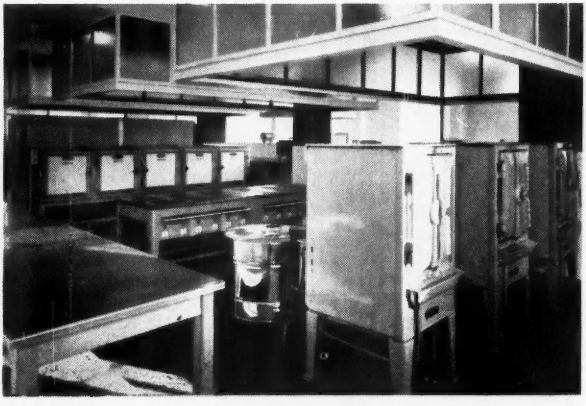
Electrical instruments for testing transformers during stoving are installed in the fan house, the necessary connections being carried by porcelain bushes through the oven insulation. The transformer may be kept under constant observation through an inspection window, the interior of the oven being illuminated by four "Osram" fluorescent tubes set behind frosted glass in the back wall. An emergency door is provided between the oven and the fan house.

All-Electric Kitchen at Bankside

THE recently completed all-electric kitchen at the British Electricity Authority's premises, Bankside House, S.E.1, is designed to provide meals for up to 800 people. The successful tenderer for the main electrical cooking equipment was the Jackson Electric Stove Co., Ltd., which manufactured and supplied the following: One bank of five elevated ovens for roasting; one 3-tier pastry oven; three steaming ovens; two 6-plate boiling tables; two 2-pan fish fryers; three 30-gall vegetable boiling pans; and one double compartment table model grill. In addition the company also supplied a food mixer, potato peeling machine, food slicer, dish washing machine, and a fish cabinet, together with stainless steel sinks and tabling in the kitchen and washing-up area.

The dining hall service which is on the cafeteria principle is provided by a 40ft Jackson service counter with hot and cold sections supplemented by a 10ft and 14ft service counter, and hotcupboard set back from the main counter. A tea bar in the dining hall completes this well planned layout. A tea service is provided by three 20-gall water boilers installed in a separate tea room from which the tea is conveyed by mobile trolleys (fitted with insulated urns) throughout the building.

Other equipment installed in the building includes a 10ft Jackson hotcupboard and a café set together with a 4ft hotcupboard and mobile food trolleys in the first floor servery which is adjacent to a smaller dining room. The total loading of electrical equipment installed in the main kitchen, dining hall, tea service and servery is approximately 320 kW.



The all-electric kitchen of the British Electricity Authority at Bankside House

Engineering in Europe

Survey of Current Literature

A VERY convenient and cheap method of tapping small amounts of energy from a high voltage transmission line is by a capacitive aerial. The economic importance of this method resides in the fact that, since the voltage picked up by the aerial is only a fraction of the operating voltage of the line, the step-down transformer may, for instance in the case of a 110 or 220 kV line, have a rating of 6 or 10 kV on the h.v. side instead of the full voltage rating. Even the earth wires of the transmission line itself may be used as aerials.

Representative figures of the powers obtainable in this way are: using 1 km earth wire, from a single circuit 110 kV line, 50–60 W, from a double circuit 110 kV or single circuit 220 kV line, 150–160 W; with an antenna consisting of three separate conductors, 200–250 W is obtainable from a 110 kV line. Existing tappings of this kind supply on an average 200–500 W, in some cases up to 3·2 kW. They are mainly used for lighting loads by line servicing and repair gangs. The article gives the full theory of the method, including determination of antenna potential and capacitance, mapping of the field of transmission lines, determination of optimum working conditions of a tapping station, current distribution in a tapping system allowing for saturation of the transformer, and calculation of power obtainable.—" Capacitive Tapping of Power from a Transmission Line," V. D. Yurenkov, *Elektrichestvo* No. 7, pp. 32–40, 1952, in Russian.

Measuring Sheet Steel Losses

Magnetic materials are basically characterized by their permeability and losses. The classical testing method uses Epstein's apparatus, but it is not suitable for supplying all the data nowadays required (e.g. initial permeability, losses at high flux-densities) nor for the many modern magnetic materials (Fe-Ni alloys, multi-component alloys). The method evolved over many years in the A.E.G. laboratories requires a moving-coil instrument with a mechanical or vibrator type rectifier in series and enables the a.c. hysteresis loop to be plotted point by point with a remarkable accuracy and sensitivity in the 10–100 c/s frequency range.

The specimens tested are two sheets 500 by 500 mm² and the permeability and loss figures are measured from their initial values up to those at saturation on the same specimen along and across the direction of rolling. Thus unambiguous values are obtained, without edge and joint effects, or influences of the closing yoke. Conversion of the losses to sinusoidal voltage is obtained by varying the form factor and therefore the wave form of the supply is without influence. The precision of the measurements is ± 1 per cent and at flux densities above 15,000 gauss it is ± 2 per cent. Separation of the losses into hysteresis and eddy current losses is by variation of the form factor. There is no loss of material, because sheets of the size 500 by 500 mm² may serve many practical purposes.—" A.C. Measurement of the Magnetic Characteristics of Sheet Steel," F. Koppelmann, *A.E.G.-Mitteilungen*, Vol. 42, No. 7/8, pp. 172–180, July-August, 1952, in German.

Determining Dampness

The degree of dampness of the windings of electrical machinery is a primary consideration, not only because the insulation resistance and thus the safety and reliability of operation depend on it, but also because none of the existing methods of determining dampness is by itself capable of providing indisputable evidence of the certainty of its indications. It follows that only a combination of several of the known methods, such as controlled heating and measurement of the insulation resistance at 60–70 deg C, the "capacitance-temperature" or the "capacitance-frequency" methods, will furnish reasonably trustworthy results. As a subsidiary method tan δ measurements will serve, and breakdown-voltage testing of the insulation

is a further way of confirming the results obtained by other methods.

Which methods are selected will depend on the conditions of the individual case, because the methods requiring temperature rises are not always possible. On the other hand, where drying is concerned, the main question is not the method of drying, but whether or not drying is absolutely necessary, since particularly in the case of generators there are strong reasons for dispensing with it as far as possible. A wide variety of drying methods have been suggested and tried out, particularly on transformers, for instance with and without oil, in vacuum, with air-blast inside and outside the tank, in drying cupboards, etc. The author reviews a great number of papers and also standards and regulations on the subject and has some valuable comments and suggestions to offer.—" Determination of the Dampness and the Progress of Drying of Transformers and Generators," I. A. Syromyatnikov, *Elektrichestvo* No. 8, pp. 9–14, 1952, in Russian.

Magnet Tester

Stablein's double-yoke magnet tester is an apparatus for determining the permanent magnetic characteristics of specimens of material and finished magnets of various sizes. It consists of an adjustable double yoke, into one pole space of which the specimen is clamped, the other pole space remaining empty. The flux produced by the magnetizing coils is closed through the two yokes and pole spaces.

Without a specimen in the pole space, no magnetic potential differences exist between the yokes owing to the symmetry and equilibrium of m.m.f.s and reluctances, respectively. The yokes also possess a central bridge of highly-permeable material with an air-gap in which a flat iron-less generator coil driven by a synchronous motor rotates (" J-generator "). This coil will not cut any flux lines, if there is no specimen inserted, but with a specimen it will cut a number of lines corresponding to a known fraction of the magnetizing flux J in the specimen. Thus the current circulating in the generator circuit, through a rectifier and ammeter, represents a precise measure of the magnetization $4\pi J$ of the specimen.

The field intensity H is measured in a similar way and simultaneously, all the instruments required being conveniently built into a measuring desk. The article describes the instrument and its mode of operation and some further improvements, making it more suitable for modern highly-coercive magnetic materials.—" Improvements in the Magnet Tester," P. K. Hermann, *A.E.G.-Mitteilungen*, Vol. 42, No. 7/8, pp. 184–188, July–August, 1952, in German.

Surge Generator

A 3 MV Greinacher type surge generator erected in the transformer testing laboratory of the Ateliers de Constructions Electriques de Charleroi (A.C.E.C.) is described in essential detail in this article. The reason for choosing the Greinacher circuit was mainly that its voltage efficiency for small capacitances may be very high (98 per cent for a 1/50 μ wave). It is, however, not possible fully to utilize this theoretical value owing to difficulties arising in the arrangement of a resistive potential divider for measuring the voltages produced, but a satisfactory compromise could be found, as the principle of the circuit may be carried out by a great number of variants, of which more than one satisfy the necessary conditions.

Another critical point is the most suitable value of the capacitance of the generator, which has a definite minimum for any wave form it is intended to produce, or, more accurately, the capacitance ratio of tested apparatus to generator has a minimum value below which it is impossible to produce the wave in question. The capacitance ultimately chosen was 12,000 pF, corresponding to a stored energy of 54 kJ. The no-load voltage of 3 MV enables 100 MVA/440 kV transformers to be tested. The paper includes complete test reports with oscillograms obtained on a 20 MVA/220 kV transformer and, in a concluding section, the author re-states the main advantages of the method of impulse testing of transformers, refuting some of the undeserved criticism levelled at it.—" A New 3,000 kV Surge Generator for Systematic Tests on Large Transformers," M. Pierson, *A.C.E.C.*, Charleroi, No. 2, pp. 2–30, 1952, in French.

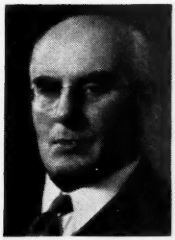
Readers who require accurate full translations of any of the articles abstracted in this section can be put into touch with the translators who will supply them at current rates.—Editors, *Electrical Review*.

PERSONAL and SOCIAL

News of Men and Women of the Industry

IT is announced by W. T. Henley's Telegraph Works Co., Ltd., that **Sir John Dalton** is to join the board of the company. At the last annual general meeting of the company, Sir **Montague Hughman** announced his intention to retire, and it is understood that

Sir John Dalton



Sir Montague Hughman

Sir John will succeed him as chairman of the parent and subsidiary companies. The Cable Makers' Association has agreed with Henley's to release Sir John from his position as Director of the Association as soon as his present commitments permit, which is expected to be about the end of March next.

Sir Montague Hughman has been a director of Henley's since 1924 and he was elected chairman in 1933. He was born at Leeds in 1876 and was educated at St. Mark's College, Chelsea. He was trained as an assistant to the late Robert Hammond and was for many years engaged in engineering and shipbuilding activities in India: he travelled extensively, studying British, foreign and colonial administration and trade development. Sir Montague is a vice-president of the B.E.A.M.A. and has been a vice-president and member of the Council of the Royal Society of Arts. He was a founder and hon. organizing secretary of the Institution of Engineers (India) in 1918-19 and acted as hon. secretary of the I.E.E. Indian Section from 1912 to 1921.

Sir John Dalton, A.M.I.E.E., F.C.I.S., Barrister-at-Law, was appointed Director of the Cable Makers' Association upon the death of Sir Thomas Purves in 1948. Sir John is a Londoner, born in 1889, and most of his career has been spent in the electricity supply sphere. He was legal adviser to the former Electricity Commission from 1922 to 1927 and thereafter until 1945 was director and general manager of the County of London Electric Supply Co. and its associated companies. Then for about two years he was a director of the London Power Co. and Central London Electricity, Ltd. During the 1939-45 war Sir John was regional controller of fuel and power, London and S.E. England, and chairman of the Public Utilities Coal Committee. He was knighted in 1942. For a time he was a member of the South Eastern Electricity Board. Sir John has been responsible for several works on electricity supply law.

Following upon the recent visit to Bepco Canada, Ltd., by representatives from each of the four British constituent companies, the following senior executive changes have been agreed upon and are announced by the board of the Canadian company with effect from 31st March, 1953. **Mr. C. G. Abbey** (Montreal), president and general manager since 1933, will assume the newly-created position of chairman of the board and will be succeeded as president and general manager by **Mr. Brian M. Burt** (Montreal), who has been associated with Mr. Abbey as vice-president and chief engineer since the establishment of the company. **Mr. F. E. Regan** (Toronto), Ontario branch manager, will become vice-president of the company.

Mr. Abbey joined Lancashire Dynamo & Crypto, Ltd., in 1911, and has been in constant

Mr. C. G. Abbey

Mr. B. M. Burt

Mr. F. E. Regan

association with that company all his working years. After passing through various stages of the business in the United Kingdom, he was sent to Canada in 1926 as president and general manager of the company's Canadian subsidiary. In 1933 he was active in the amalgamation of the Canadian branches of Bruce Peebles & Co., Ltd., Crompton Parkinson, Ltd., Harland Engineering Co., Ltd., and Lancashire Dynamo, which formed Bepco Canada, Ltd.

Mr. Burt went to Canada in 1930 as director and general manager of Harland Engineering Co. of Canada, and joined Bepco on its formation in 1933. After serving his apprenticeship with British Westinghouse Co. in Manchester, and a course at Manchester College of Technology, Mr. Burt enlisted in the Royal Naval Air Service in 1917. On discharge he enrolled at Manchester University and graduated B.Sc.(Tech.) with first class honours. He was also awarded a Manchester Corporation research scholarship. Joining Ferguson Pailin, Ltd., he became chief draughtsman and contracts manager. In 1926 he joined Harland Engineering Co. as managing engineer.

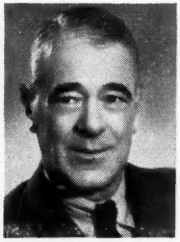
Mr. Regan's engineering career has been associated solely with Lancashire Dynamo & Crypto, and Bepco, dating back to 1926, when he graduated in electrical engineering from Royal Salford Technical College. He served an apprenticeship course at Lancashire Dynamo's Trafford Park works, and went to Canada in 1927 as sales engineer for Lancashire Dynamo. In 1932 he was moved to that firm's Toronto office as assistant manager and, after Bepco was formed in 1933, Mr. Regan was appointed Ontario branch manager. In 1950 he joined the board.

Mr. P. Ridings, M.I.Mech.E., generation engineer (operation), No. 2 Sub-Division of the North Western Division of the British Electricity Authority, retired on 2nd October after forty-four years' service in the electricity supply industry. At the age of twenty-one Mr. Ridings became junior engineer with the Middleton Corporation Electricity Department, and two years later was appointed charge engineer. In 1918 he transferred to the Lancashire Electric Power Co. and in 1929 was appointed resident engineer. In the capacity of generation engineer (O), No. 2 Sub-Division, a position which he has held since March, 1948, Mr. Ridings has been responsible for fifteen stations including the new high-pressure stations at Agecroft and Westwood (Wigan). At a formal presentation ceremony on 17th October, Mr. Ridings was presented with a gold wristlet watch and presentation book on behalf of his colleagues by the divisional controller, Mr. A. R. Cooper.

Mr. J. R. Appleton, M.Sc.Tech., A.M.I.E.E., A.M.I.Mech.E., senior assistant engineer (mechanical) No. 3 Sub-Division since March, 1948, of the North Western Division of the B.E.A., has been appointed station superintendent at the new Carrington generating station and takes over his new duties on 1st December. Mr. Appleton, who is forty-five, commenced his service in the electricity supply industry in 1934 as junior assistant at Stuart Street power station, Manchester, and in 1947 he was appointed assistant resident engineer at the station.

The Metropolitan-Vickers Electrical Co., Ltd., announces that on 1st November **Mr. W. A. Coates,** M.I.E.E., F.Amer.I.E.E., was appointed general sales manager and **Mr. F. Gurney,** M.I.E.E., was appointed manager, home sales.

Mr. Coates, who succeeds the late Mr. Duncan MacArthur, retains his seat on the board. He is a well-known authority on switchgear. On leaving Finsbury Technical College he had three years' special training with the British Thomson-Houston Co., Ltd. He joined Metropolitan-Vickers (then the British Westinghouse Co.) at Trafford Park in 1909 and, except for a period as chief engineer of the Ferranti Electrical Co. of Canada, has been with the company ever since. Mr. Coates became chief engineer of the Switchgear Department in 1919 and in 1922 went overseas, first to Japan and later to Australia and New Zealand. In 1927 he returned to



Mr. P. Ridings

Mr. J. R. Appleton

Mr. W. A. Coates

Mr. F. Gurney

specialized work in the Switchgear Department, where he was successively consulting engineer, supervising the company's work for the Central Electricity Board during the initial stages of the British grid, and sales manager. He was appointed manager, home sales, in 1946, and in 1948 became a director of the company. He is also a director of Metropolitan-Vickers-Beyer, Peacock, Ltd. and Sunvic Controls, Ltd.

Mr. Gurney was educated at Keighley Grammar School and received his engineering training with the Yorkshire Electric Power Co. He joined Metropolitan-Vickers in 1919, and after a period in the Motor Sales Department he went to the Manchester district office. Subsequent district office appointments, as manager, were Stoke-on-Trent in 1929 and Leeds in 1933. In 1941 he returned to Trafford Park to become sales manager of the Transformer Department, and four years later, sales manager of the Plant Department. In 1949 he was appointed assistant manager, home sales. Mr. Gurney was chairman of the North Midland Centre of the Institution of Electrical Engineers in 1941-42.

Mr. H. L. Bowen, a technical executive of the Valve Division of Mullard, Ltd., has recently completed his twenty-fifth year with the company. To mark the occasion an informal luncheon was held recently at Frascati's Restaurant, London, when Mr. T. E. Goldup, a director, presented Mr. Bowen with an inscribed gold watch and a cheque. Mr. Bowen joined the Mullard Co. as an outside technical representative in 1927, and in 1929 moved to the company's London offices, where he helped in the formation of the Mullard Technical Service Department.

Mr. H. L. Bowen

From 1931 to 1939 Mr. Bowen was principally engaged on technical liaison work and in 1940 he took charge of the Technical Service Department. For a number of years he has been a member of various committees of the British Radio Valve Manufacturers' Association. He is now chairman of the B.R.V.M.A. Technical Committee. He is also a member of various B.S.I. Committees, and a member of the Valve Standardization Committee of the International Electrotechnical Commission.

We are glad to learn that **Mr. F. H. Schroeder**, A.M.I.E.E., a director of Lancashire Dynamo Holdings, Ltd., and sales director of Lancashire Dynamo & Crypto, Ltd., who underwent an operation in the Royal Northern Hospital, has made a speedy recovery and has now returned to his office.

Mr. S. E. Wilson receiving a presentation from Mr. H. P. Rich on completion of twenty-five years with Rich & Pattison (B'ham), Ltd.

In our last issue we referred to the presentation made to **Mr. S. E. Wilson**, manager of Rich & Pattison (B'ham), Ltd., on completion of twenty-five years' service with the company. We now reproduce a photograph showing Mr. H. P. Rich, managing director, making the presentation.

Sir Herbert W. Barber, district manager, Manchester, of Johnson & Phillips, Ltd., was entertained to a complimentary dinner on 31st October by the aldermen and councillors of Southport Corporation, of which he is an alderman and leader of the Council. During the evening, on behalf of the members of the Council, the Mayor presented Sir Herbert with an engraved silver salver.

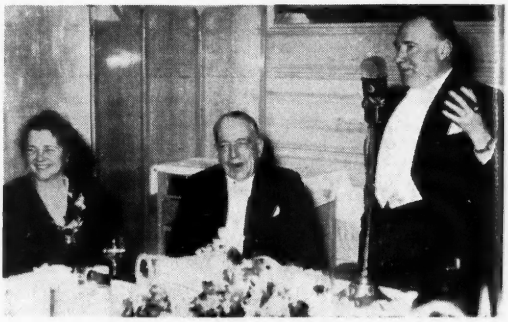
At the annual meeting of the B.I.F. (Birmingham) Electrical Exhibitors' Committee last week, **Major W. Percy McGeoch** (W. McGeoch & Co., Ltd.) was re-elected chairman for the ensuing year and **Mr. W. T. Litchfield** (English Electric Co., Ltd.) was re-elected vice-chairman. The representative committee remains unchanged with the exception of the substitution of the British Plastics Federation for A. Reyrolle & Co., Ltd.

Mr. G. D. Johnson and **Mr. R. W. Holledge**, A.C.I.S., have been appointed directors of the Stearn Electric Co., Ltd. Mr. Johnson was for many years manager of the company's branch at Nottingham, and Mr. Holledge was secretary of the company.

The Plessey Co., Ltd., has appointed **Mr. J. L. Furner** to be sales manager of its Telecommunications Division. He succeeds **Air Commodore T. P. Fagan**, whose new appointment entails liaison with foreign Governments and Government Departments on behalf of the company. Mr. Furner was for twenty-six years with Mullard, Ltd. He was

for six years with the R.A.F. in command of radar stations in various parts of the country.

There was a large gathering at the annual dinner-dance of the **Association of Electrical Machinery Trades**, which was held on Friday last at the Savoy Hotel, London. Mr. H. A. C. Hassall, who was elected chairman of the Association in June last, has had to resign owing to ill-health, and Mr. J. A. Hardy (A.A. Electrical Co., Ltd.), who has succeeded him, presided. In proposing the toast of the guests, Mr. Hardy expressed the members' regret at Mr. Hassall's resignation, and the hope that he would be speedily restored to health.



Mr. W. E. Lawton, president of the A.E.M.T., appealing for contributions to the Electrical Industries Benevolent Association. On his right are Mr. A. L. Johnson and Mrs. Lawton

The response was by Mr. A. L. Johnson, M.A., chairman of the Education Committee of the Worshipful Company of Tin Plate Workers, alias Wire Workers, of the City of London, who said that young people seeking to improve themselves needed guidance from those employing them. He referred to the conversations taking place between the Association and City and Guilds of London Institute relating to technical education and youth training, and said technical instruction was not enough—trainees should have a wide knowledge of general affairs. A persuasive appeal on behalf of the Electrical Industries Benevolent Association was made by Mr. W. E. Lawton (president of A.E.M.T.) which, with the proceeds from a number of prizes distributed during the evening, resulted in a substantial sum being raised; this will be increased by donations still coming in from members of the A.E.M.T. The formalities of the evening were concluded by a speech by Mr. J. T. Morgan, given in his inimitable manner. An excellent cabaret formed part of the evening's entertainment, and dancing continued until after midnight.

Mr. A. J. C. MacLeod, A.M.I.E.E., export manager of Lancashire Dynamo & Crypto, Ltd., will be leaving London Airport on 17th November by "Comet" airliner for an extensive business tour of Pakistan, India, Ceylon and Cyprus on behalf of the Lancashire Dynamo group of companies.

The Amateur Dramatic Society of **W. T. Glover & Co., Ltd.**, recently presented "Worm's Eye View" on four nights, and the performances were attended by over 600 people.

OBITUARY

Mr. A. P. Wood, founder and first managing director of the Lancashire Dynamo & Motor Co., Ltd., the forerunner of the Lancashire Dynamo & Crypto, Ltd., died last Friday at the age of eighty. It was in 1899 that Mr. Wood realized that the development of industry in the Trafford Park area, coupled with the transition from steam to electric power would produce a great demand for electric motors. With local financial backing he therefore formed what was one of the earliest companies devoted to the manufacture of this type of equipment. Although Mr. Wood's full-time association with the company had been severed for some twenty years, he had always maintained a close interest in L.D.C. affairs and was present at the festivities when the company celebrated its jubilee.

Mr. E. R. Keightley, who had been the representative of Gent & Co., Ltd., for general industrial sales in London and the South of England, died on 24th October at the age of forty-three. He had been with the company since 1925.

Mr. S. T. Buer, a member of the headquarters staff of the technical director of Standard Telephones & Cables, Ltd., died on 29th October in his sixty-fourth year. He joined the company (then Western Electric Co.) in 1912 after service with the National Telephone Co., and from 1933 to 1948 he was chief transmission engineer at Standard's North Woolwich Location.

Mr. M. Clark.—The death occurred on 1st November, at the age of fifty-nine, of Mr. Malcolm Clark, vice-chairman of Richardsons, Westgarth & Co., Ltd., and vice-chairman of George Clarke (1938), Ltd., and the North Eastern Marine Engineering Co. (1938), Ltd., both subsidiaries of Richardsons, Westgarth.

Mr. M. Andrews.—The death is reported in Belfast of Mr. Martin Andrews, senior control engineer of the Northern Ireland Electricity Board. Mr. Andrews, who was fifty-one, joined the Electricity Board in April, 1935. He came from Kennedy & Donkin, consultants to the Electricity Board.

Lower White River Plant

Hydro-Electric Station in Jamaica

WHAT is known as the Lower White River hydro-electric scheme of the Jamaica Public Service Co., Ltd., was brought into commercial use when the station was officially opened by the Governor of Jamaica earlier this year. Operated as a base load plant in conjunction with existing hydro-electric stations at Bog Walk, Roaring River, and Upper White River, together with a steam station and a number of diesel-electric units, this scheme represents an important addition to the island's generating capacity.

The work was carried out to the instructions of the Stone & Webster Service Corporation, of New York, who retained Messrs. Ewbank & Partners, Ltd., and Sir William Halcrow & Partners as consulting engineers for the electrical and mechanical and the civil engineering work respectively.

The Lower White River station utilizes the discharge from the Upper White River plant, which derives its water mainly from a spring in the Mount Plenty region. Due to natural underground storage, the flow is normally constant at about 180 cusecs, although there are indications that very severe floods have occurred in the vicinity of the power house. To enable power to be generated from the lower station in the event of the upper station being shut down, a by-pass valve for the upper station has been included in the project.

A lined canal approximately 915ft long carries the water to a 6ft diameter wood-stave pipe, 9,423ft long, followed by a 5ft diameter steel penstock, 518ft long, which connects to the turbine. At the junction of the wood-stave and steel pipes rises a 65ft high simple steel surge tank of 30ft diameter, standing about 160ft above ground level, the power house being at the foot of the gorge. The water is discharged once more into the White River, the gross head available being 398ft.

Surge tank and high pressure pipe line with power station in foreground below

Access to the station is by a meandering road out on to the cliff, at one point passing through a curved tunnel. All the heavy equipment was brought into the station down this steep road without mishap.

The two-floor station contains a single generating set of the vertical shaft type rated at 4,750 kW and manufactured by the Harland Engineering Co., Ltd., of Alloa, Scotland. Owing to the high floodwater level that may occur, the generator floor is 18ft above turbine floor level and special consideration had to be given to keeping all essential electrical apparatus above flood level. Although initially designed for 40 c/s operation, the plant is capable of operating at 50 c/s (the proposed standard frequency for the island), which has been achieved with only negligible effect on efficiency by providing a dual-speed machine to run at 480 r.p.m. and 600 r.p.m. for 40 and 50 c/s duty

respectively. Only minor modifications to the governor, and switch and control gear, will be necessary in the event of a frequency change-over.

The turbine inlet is equipped with a 36in diameter "Harland-Morgan Smith" electric-motor-operated "Rotovalve" of the full-bore plug type, which does not obstruct the free flow of water, the friction loss being equivalent to that of a pipe of equal length and diameter; in addition, it needs only small operating forces and a by-pass filling valve is not necessary. Opening and closing is done with a single stroke in each direction of the mechanical actuating mechanism which is so designed that before and after its rotation the plug is unseated and reseated respectively; the sealing faces can thus be kept away from the path of the water except during rotation. When tested under pressure, the leakage past the monel metal seats was only 1¼ ounces a minute, well within the expected figure for a valve of this size. The valve is operated from the generator floor where there is a headstock carrying the driving motor, interlocked with emergency hand-gear, and limit switches for control, indication, and interlocking purposes.

The vertical shaft, single runner, "Harland-Morgan Smith" Francis-type turbine is designed for an output of 6,900 b.h.p. under 378ft net head, without gear or belt drives off the main shaft. Its erection and commissioning at site were completed in just over four months.

The draft tube liner, spiral case, curb ring, bottom plate, head cover, bearing housing, gate operating ring and pit liner are all of fabricated construction. The turbine shaft has a stainless steel alcove where it passes through the packing box. The turbine runner is of cast stainless steel and is bolted to the shaft flange. Both the bottom plate and head cover have renewable mild steel wearing plates, while the curb ring has a renewable cast steel liner.

Each wicket gate is connected through an arm and breaking link to the gate operating ring. An eccentric pin in the linkage mechanism enables wear between adjacent gates to be taken up by simple adjustment.

An unusual feature of both turbine and alternator is their self-lubricating bearings; all (both axial and radial) are of the self-aligning, pivoted pad Michell type without any external oil circulation system, but internal cooling coils are fed with water from the penstock through a pressure reducing valve. The three radial bearings in the set contain pads which are interchangeable, thus making it possible to carry only one set of spares in the convenient form of simple pads. Each bearing is fitted with a mercury-in-steel thermometer with its indicating instrument on the turbine panel at alternator floor level. The instrument dial has two adjustable maximum electrical contacts, one arranged to give an alarm at a predetermined temperature and the other to initiate shut-down of the machine at a higher temperature, but below the danger point. Additional protective devices include a flow indicator on the cooling water outlet from the bearing and a submersible level switch to provide an alarm in the event of inundation by a major flood or failure of the station sump dewatering service.

The flyball head of the 10,500 ft/lb oil pressure governor, which is sensitive to a speed change of $\frac{1}{100}$ of 1 per cent, is motor driven, the motor receiving its input from a permanent magnet generator

Assembling the exciter on top of alternator

directly coupled to the main alternator. Belt or mechanical gear drives are dispensed with so that the governor can be placed in the best position commensurate with ease of control and access. It is equipped for fully automatic operation and runs up the turbine under its own control on receiving the starting impulse, allowing the turbine to accelerate evenly up to normal speed, when the flyball head takes control. Automatic governor brakes are included and hold the turbine wicket gates closed when the machine is at a standstill and in the event of an oil pressure failure.

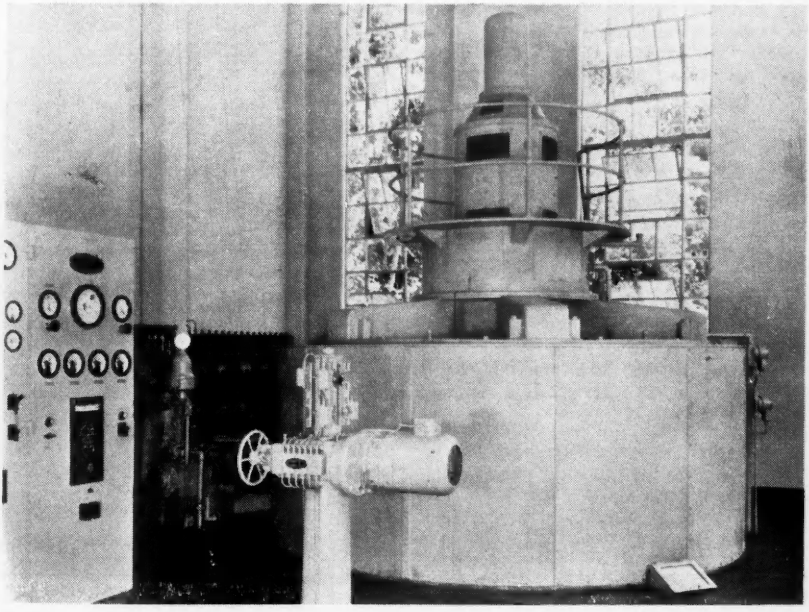
A motor driven speeder device enables the speed of the machine to be varied by hand, or distantly, from minus 15 per cent to plus 5 per cent of normal speed for synchronizing. It is also used for loading purposes when the machine is connected to the electrical system. In addition, there is a speed drop (permanent speed variation) adjustment which can be set at any value between 0 and 5 per cent of normal speed, as required for parallel running conditions.

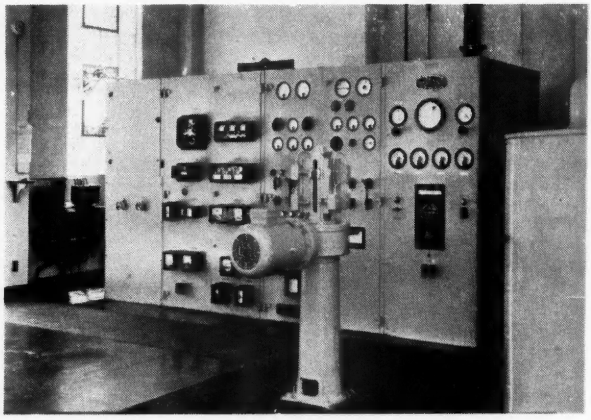
A manually-operated load limiting device can be used for starting up and shutting down the machine under hand control, utilizing the oil pressure; when oil pressure is not available the turbine may be controlled by handgear mechanically operating the wicket gates.

A gear type oil pump driven by a 3½ h.p. squirrel cage induction motor delivers the governor oil to an accumulator; as the compressed air cushion in the latter is created by the oil pump, a special compressor is not required. The receiver has a pressure switch with electrical contacts arranged to shut down the generating set and give an alarm at a predetermined low pressure. The pump runs continuously to build up working pressure, then unloads and returns its oil to the sump tank.

The permanent magnet generator associated with the governor equipment is fitted with self-resetting snap-action mercury switches. One of them is set at 30 per cent above normal speed and initiates shutdown of the unit. Another is interlocked in the alternator brakes circuit, so that braking cannot be applied in the event of emergency shut-down due to hot bearings until the speed of the unit has

General view of alternator and turbine panel with governor between them in background and "Roto-valve" control pedestal in foreground





Main control board with integral turbine panel and station common services board under window on left

fallen to 95 per cent of normal. A third allows brake application under all other conditions, but only when the speed has fallen to 50 per cent of normal. The fourth, set at 75 per cent of normal speed, is the last link in the chain of events that culminates in the signal that the machine has started, is running properly, and is ready for synchronizing.

The turbine is coupled through an intermediate shaft to a vertical shaft "Harland" three-phase a.c. synchronous generator of 5,600 kVA at 0·85 power factor (lagging) and 6,900 V. It is duct ventilated; cooling air enters through both top and bottom brackets and is forced by fans on to the rotor through radial ducts in the stator core. The warm exhaust air is collected in a duct surrounding the stator frame and discharged through ducting passing through the downstream wall of the station.

The stator core segmental laminations are secured to the fabricated frame by dovetail keys, the core being clamped between end-plates. The stator is diamond wound and the preformed coil out-hangs are braced.

The rotor hub, which was shrunk on to the shaft, was built up of steel plates welded together and stress relieved. The underside of the hub has a finely machined face that forms a track on which the hydraulic brakes operate. The rotor poles carry a damper winding in semi-enclosed slots near the faces. The field coils are formed of copper strip wound on edge, the individual turns being insulated from one another, mounted on insulated steel spools.

Both top and bottom brackets are of fabricated construction and have adjustable screws to facilitate erection and centralizing of the rotor. The lower guide bearing is in the bottom bracket while the top bracket carries the combined thrust and guide bearing, the thrust collar being keyed and locked to the rotor shaft.

The exciter is on the top bracket, its armature being built on a stub shaft solidly coupled to the main generator shaft; separate bearings are not used on the exciter. Two cupro-nickel sliprings immediately above the exciter commutator are connected to the alternator field winding by cables passing through the hollow shaft.

The plant is arranged for either manual, local automatic, or remote automatic control, the last mentioned being the normal method of operation and is carried out by supervisory control equipment at the Upper White River station. All supervisory orders are transmitted by impulses over 50 V pilot cables, and alarm and trip indications are repeated in groups at the remote control station.

Gas Council's Report

IN its third year of nationalization the gas industry had a net surplus of £1,440,916 with an accumulated surplus from the date of nationalization of £3,404,443. The Gas Council's report for the year ended 31st March last shows that all but two of the 12 area gas boards made a surplus on the year's working. The gross revenue was £261 million compared with £234 million in the previous year. Sales of gas totalled 2,513 million therms against 2,466 million. Domestic sales decreased by 0·6 per cent, but industrial sales rose by 7·5 per cent and commercial by 6·5 per cent.

VIEWS on the NEWS

By REFLECTOR

TWO points seemed to me to stand out in the B.B.C. "Taking Stock" feature last week entitled "What Sort of Heat?" The first was agreement among the speakers of the paramount need to export coal. It was therefore hardly consistent to advocate, as one speaker did, the use of gas for domestic purposes. Gasworks require a high grade of coal that is in world demand whereas, as Sir Vincent de Ferranti pointed out, the B.E.A. uses coal which is unsuitable for export. The second point was that many years are likely to elapse before 36 million fires of twice the present efficiency could be mass-produced, apart from the consequent drain on foundry resources, even if the requisite kind of fuel could be made available.

* * *

My reference to failing street lamps (31st October issue) has brought me a note from Mr. H. Payn, manager of the Boston District of the East Midlands Electricity Board. Mr. Payn encloses a postcard which is issued in sufficient quantities to lighting authorities in the district (particularly rural district and parish councils) which, in turn, distribute them to their members. These members keep an eye on the lighting in their neighbourhoods and send a card to the district manager if they see anything untoward. Mr. Payn considers this (as I do) a useful alternative to a patrol system which would prove rather expensive in an extensive area in which there are many widespread villages.

* * *

In dealing with electricity supply problems in this country we are apt to forget the difficulties which beset electricity supply companies in disturbed parts of the world. I am reminded, however, of the hazardous conditions, often accompanied by personal danger, no doubt, under which the staff of the Perak River Hydro-Electric Co., Ltd., Malaya, has to work. Mr. H. G. Balfour, chairman of the company, in his review of the past year, records that supply was interrupted on 26 occasions by interference with transmission lines, and on 11 occasions by equipment on consumers' premises being damaged by fire. It says much for the loyalty of the staff that despite these efforts to disrupt the supply system, electricity output during the year actually increased.

* * *

A member of the Llandrindod Wells Urban Council, commenting on the increase of charges to consumers by the South Wales Electricity Board, said, among other things, that it was a dastardly thing to do. His adjective was not well chosen, I think. The *Oxford Concise Dictionary* defines a "dastard" as "coward, skulker, esp. one who commits brutal act without endangering himself." Even an Electricity Board should not be so described.

* * *

"Wondering Parent," in a letter to the *Bolton Evening News*, asks why 13-year-old girls are being taught to wire electric plugs. He (or she) fails to see that it is an essential subject for education and says that electricity is dangerous for anybody to tamper with unless he or she is a qualified person. I think the question is justified but people will do their own minor electrical jobs and maybe it is as well to teach them to do the work properly.

* * *

In this country when we abbreviate steam pressure figures we employ lb per sq in or preferably lb/sq in. Some years ago the Americans started to use the term "p.s.i." Soon the stops disappeared and it became "psi," giving it a Greek appearance. Now a "g" is added for "gauge" and the result is a reference in an American journal to "1200 psig-steam." Am I old-fashioned to prefer the British method?

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Domestic Electricity

AS I have recently completed a book of over a quarter of a million words encouraging householders to use electricity for every purpose, I was shocked to read in *Hansard* recently that Mr. Nabarro and his solid fuel enthusiasts are prepared to deal harshly with all such as me and demand that the Minister of Fuel does likewise.

After hearing the debate on the use of fuel for heating, in the Home Service on 6th November, I find that the enemies of electricity still confuse plant shortage with coal shortage for while, in this unbalanced debate, Sir Vincent de Ferranti's three opposers sincerely considered that to switch on a fire shut down a machine, and to consume electricity for anything other than lighting and a few power driven appliances was wasting the nation's coal resources, they will agree to Ferranti, Ltd., consuming electricity (therefore coal) during the small hours.

The extent to which the solid-fuel propaganda machine is geared up for action is nothing short of alarming, presumably with a view to enforcing a "subsidized" monstrosity on to the reluctant housewife, even if it will take twenty years to re-grate the homes of Britain. Guiding the housewife, is the term they employ, while admitting that the weapon they wish to employ is a monetary one.

With the known high diversity factor of unrestricted domestic development of electricity resulting in a high load factor, it is surely better to wire for the atomic age since it appears that the harnessing of nuclear energy for electricity generation will probably coincide with the cessation of coal production.

As the owner of an all-electric house since pre-war days when I was responsible for part of Britain's development of domestic electricity, I do not think that my 25 kW (connected) load in suburban Harrow will embarrass the Eastern Board's engineers, whose chairman spoke in favour of domestic development in his recent presidential address to the A.S.E.E.

Harrow, Mdx. G. A. T. BURDETT.

Gas *versus* Electric Cooking

THE article on this subject by Mr. W. J. L. James in your 17th October issue raised quite a few points which do not appear to have been given a great deal of attention by the industry as a whole. From some of the comments it would appear that very little time is spent on research into the best and most efficient methods of placing elements for heating the oven, the sizes of hotplates, methods of control and the loading of each of the individual heating components. It is doubtless in the direction of research that the gas cooker has progressed and outstripped its electric brother.

In addition, the electric cooker has many potential advantages over the gas cooker which do not appear to have been exploited by any manufacturer in this country, for anything more simple than electric control for automatic timing and temperature would be difficult to find. Why, then, has not some manufacturer produced a cooker incorporating automatic temperature control, automatic switching with time clock control, timer and alarm, a permanent clock, a light for the hob and a light for the oven operated by opening of the oven door, whether the oven be on or off? The latter point is most essential as it is not always possible to site the cooker so that light from a window or lamp shines directly into the oven when the door is open.

Incidentally, why has an electric oven to be removable for cleaning? This is not necessary for gas, although the heating medium is inherently more dirty. Would domestic ovens heated by infra-red rays be a proposition? Has any investigation into this form of oven heating been undertaken, either on its own or in conjunction with the more traditional methods at present employed, and if so, with what success?

A cooker based on the above lines migh

be a little more expensive than gas in the first instance but there is no doubt that if the price were not prohibitive it would sell itself so long as all the devices fitted were of simple and sound construction having a long and trouble-free life.

Stoneleigh, Surrey. H. J. WILSON.

Electrically-Wound Clocks

WE were very interested in the letter in the correspondence page of your 24th October issue, signed "Y.E.D.," which referred to electrically-wound clocks, particularly in view of the fact that for the last two years or so we have been supplying and fitting electrically-wound movements, not only to industrial and domestic clocks but also to time recorders.

The movements to which we refer are wound by simply being connected to the mains (movements being available for 230 V a.c. or d.c.) and they have a spring reserve so that they will continue to function for some twenty-four hours in the event of a power cut; the a.c. movements are not affected by any variation in frequency.

Liverpool, 6. W. S. FINLAYSON,
Managing Director,
Synchromatic Time Recording Co., Ltd.

Mission to Latin-America

THE report of the British Engineering Training Mission to Latin-America has just been made available by the Federation of British Industries, 21, Tothill Street, London, S.W.1, price 7s 6d. The Mission, which consisted of Sir Arthur Fleming, Mr. F. R. Livock and Mr. W. V. Jenkins, left this country at the end of last April and after a few days in the United States visited Colombia, Venezuela, Cuba, Mexico, Peru, Chile, Argentina, Uruguay and Brazil, returning to England in August after having travelled some 20,000 miles.

The object of the Mission was to stimulate interest in the practical training in this country of Latin-American engineers, with particular reference to the F.B.I. Overseas Scholarships scheme. This scheme applies to all countries which are in process of developing their natural resources and setting up their own basic industries, it being felt that the future of British trade depends largely on the extent to which we can participate in this development. Young engineers from such countries will become familiar with British methods and equipment and accustomed to working side by side with British engineers. They will then be predisposed to buy British capital goods and make use of the technical assistance we can supply.

The scheme, which is supported by the Government, was already in operation on a small scale for certain other countries before the Mission left, but the Latin-American Republics had shown no interest. At that time it was planned to offer a total of 30 two-year scholarships each year for the whole world.

The Mission's work has resulted in the recommendation that the minimum target should be 100 scholarships for Latin-America alone and a proportionate number for other developing parts of the world. For Latin-America, certain new types of scholarship are proposed and at a Press conference last week Sir Norman Kipping announced that selection machinery had already been set up, and that it was proposed to make an immediate offer of 50 scholarships to the countries visited, ten to Brazil and five to each of the others. These would vary in value to the recipient from £900 to £600 for a two-year period in Britain with a few at £300 for shorter courses for more experienced men.

Power Production Posters

WHEN we visited the British Electricity Authority's training school at Horsley Towers, Surrey, recently our attention was caught by a series of attractive coloured wall sheets depicting in a practical and striking way the plant and processes involved in the production of electric power.

Copies of these posters have now been made generally available by the B.E.A. and they should be very useful to schools and technical colleges. There are four of the posters; they are 40in wide by 30in deep and represent oblique projections, with parts cut away, of the main sections of a power station.

Coal and ash handling plant at a station designed to handle water- and rail-borne coal forms the subject of the first one. It shows clearly the passage of the coal into the station bunkers and the subsequent disposal of ash.

A modern pulverized-fuel boiler house is dealt with by the second poster. It depicts in section the coal bunkers, pulverizing mills, furnace, economizer, air heaters, etc., in realistic colours. The third poster illustrates the construction and operation of a turbo-alternator set while the fourth shows how power is fed from the alternator through its transformer into the grid. In each case there is a small key drawing to indicate the various plant components and their functions.

Copies of the posters can be obtained from Mr. L. J. Luffingham, Public Relations Officer, British Electricity House, Winsley Street, London, W.1. On cartridge paper they cost 7s each or £1 2s 6d for the set and linen-backed 9s each or £1 11s 6d the set.

Coal By Pipeline

Two-Day Conference in London

DR. W. IDRIS JONES, director-general of research, National Coal Board, in an introductory address at a two-day conference in London last week on the transport of coal by pipeline, said the N.C.B. considered that hydraulic transport was likely to be of peculiar interest to the coal industry. They had therefore embarked on a programme of research aimed at obtaining a sufficiently full understanding of the process in order to enable them to design intelligently in the future.

The conference was opened by Sir Charles Ellis, scientific member of the Board, and those attending included representatives from the Ministry of Fuel and Power, the British Hydromechanics Research Association, the universities, the gas and electricity industries, French coal and hydraulic research organizations, manufacturers of hydraulic equipment and members of the scientific and production departments of the National Coal Board.

Avoiding Dust Hazards

If the hydraulic transport of coal underground could be shown to be practicable, Dr. Jones went on, it might become an outstandingly effective way of avoiding the grave hazards resulting from the production of large quantities of dry coal dust, as well as the need to have extensive mechanical conveyors. With hydraulic transport there would be no coal dust in the mineways and the hazards would be greatly reduced and could be dealt with by a much smaller effort.

Dr. Jones was referring to transport from the coal face to the bottom of the shaft, but they need not think of stopping there, he said, for the possibility of "pumping" the mine output to the surface was also an attractive one. The output of many collieries was limited by the winding capacity of the shafts and that generally could not be increased except by very costly alterations. But there was reasonable evidence for the belief that it might be possible to "pump" the whole output of a large colliery to the surface up a pipe of not more than 12in diameter, so that the only alteration to the shaft to allow increased output would be the installation of the pipe.

On the surface Dr. Jones thought it conceivable that hydraulic transport might prove to be a desirable alternative to other forms of transport for short hauls in and around the pits and he suggested that it might also compete for longer hauls, for instance from the coalfields to large population areas, particularly to London.

Overseas Experiments

This form of transport was not new; at Hammersmith coal was pumped 660 yards from the riverside to a boiler house before the first world war. But in the last year or so interest in this process had been revived and experiments were already being conducted in Pittsburgh, U.S.A., with a $3\frac{1}{2}$-mile pipeline for small coal and in France an installation was transporting coal slurry three miles to a power station in the Lorraine coalfield.

The British coal industry was much more interested in the transport of large coal, but coal must not be degraded by the handling process. The N.C.B. could therefore contemplate using hydraulic transport only if it could be sure of being able to specify operating conditions which would ensure not only reliable and technically satisfactory performance, but also lead to minimum costs. This they could not possibly do until they had a much better understanding than at present of the whole process of hydraulic transport and its attendant phenomena, and of the performance and design requirements of the associated machinery.

On Thursday last week those attending the *colloquium* visited the laboratories of the British Hydromechanics Research Association at Harlow, Essex, where they were able to see an experimental coal pumping installation.

Public Works Exhibition

Speeding-Up Building Construction by Electrical Means

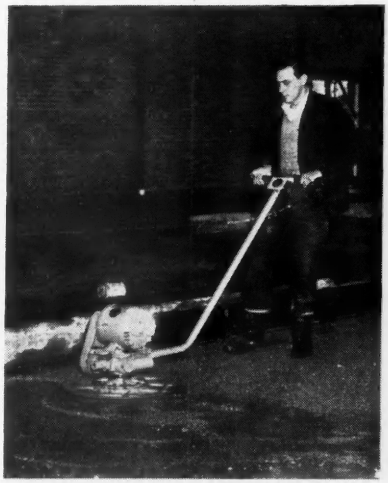
THE need to take advantage of the numerous electric time- and labour-saving devices now available if the leeway in meeting the country's building requirements is to be made up was underlined at the Public Works and Municipal Services Congress and Exhibition at Olympia, London, last week. Electricity's contribution to public health and safety was also much in evidence.

On the heavy constructional side some of the equipment was particularly suited for work in connection with large hydro-electric schemes. Pegson, Ltd., for instance, showed one of their larger primary gyratory crushers which is notable for its ease of feeding, high capacity and uniform product, coupled with low maintenance costs. Similarly Winget, Ltd., demonstrated a fully automatic concrete weigh batching plant built for the Glenmoriston scheme.

A new device which is claimed to revolutionize the laying of concrete and granolithic floors was demonstrated by the Columbus-Dixon organization. Using the Dixon concrete floating machine a single operator is said to be able to carry out in the same time work done by seven workmen using traditional methods of hand-floating. The use of a near-dry mix on which the operator can stand obviates waiting for the concrete to dry out. The heavy 24in rotating nickel-steel disc compacts the concrete, drives out air pockets, levels the surface and completes the floating and finishing process at a speed claimed to be five to ten times faster than can be otherwise achieved.

Self-contained generating plant is much in demand for site work and a large number of examples was to be seen on the stands of A. C. Morrison (Engineers), Ltd.; Associated British Oil Engines, Ltd.; George Pike, Ltd.; F. Perkins, Ltd.; R. A. Lister & Co., Ltd.; Sentinel (Shrewsbury), Ltd.; Hampson Industries, Ltd.; David Brown Tractors, Ltd.; and the British Equipment Co., Ltd.

Among the lighter tools we noticed on



The Dixon power float for laying concrete and granolithic floors

the Tarpen Engineering Co.'s stand a new portable electric road pick which can also be used for breaking out and chiselling work; with it were the Tarpen "Grassmaster" with edge trimming attachment, and a hedge trimmer, used largely by Parks and Water Departments, etc. The new "Victor" 16 lb hammer drill was shown by Greenham Equipments, Ltd., while Adam & Harvey (Rapid Hammer), Ltd., had on view the "Rapid Mate" hand drilling machine as a companion for the "Rapid Hammer." The cutter tool is one of many similar devices utilizing cartridges to shoot steel bolts, etc., into concrete, brickwork, iron and steel. It has great possibilities in the electrical contracting industry. Other types of these power driving tools were shown by F. H. Bourner & Co. (Engineers), Ltd. ("Supa"); the Langham Export Co., Ltd. ("Fix-Rammer"); Kwickform, Ltd.; and Roura & Forgas, Ltd. ("Tornado").

A comprehensive display of portable

electric tools, including drills, grinders, sanders, saws, hammers, screwdrivers, polishers, planers, routers, woodworking lathes and paint sprayers, was presented by E. R. Cole, Ltd. A high torque low speed drill for use with its various fixing devices was shown by the Rawlplug Co., Ltd. A range of portable power woodworking machinery was demonstrated by the Kiné Engineering Co., Ltd., while Teles Smith, Ltd., showed lightweight chain saws for the clearance of woodland.

Another time-saver of special electrical interest is the "Kopex" flexible conduit made by Uni-Tubes, Ltd. Comprising layers of continuous metal and paper strip, or metal strip only, spirally wound, it gives good protection to cables yet can be easily set by hand to negotiate corners and curves. The Victaulic Co.'s flexible joints, fittings and hose couplings have proved their efficiency in power station and other installations.

E.D.A. Stand

Emphasizing the service of electricity to the community the British Electrical Development Association had an attractive display specially designed to interest architects and builders. Part of the stand was occupied by a skeleton model (half actual size) of a house of two floors completely wired for electricity. Another section drew attention to the need for adequate lagging of the storage tank of an electric water heating system.

A series of large photographs indicated a number of municipal uses of electricity, such as transport, heating, lighting, road safety, health services, communal laundries, refuse collection and disposal, and sewage disposal. An illuminated display showed applications of high efficiency fluorescent lamps to street lighting, with emphasis on the latest types of wall-mounted lanterns for use in narrow streets or in situations where it is undesirable to erect lamp standards. Another special feature was a laundry unit evolved to solve the problem of communal washing on Council housing estates. It consists of an electric washing machine which heats its own water, a hydro-extractor and a laundry truck. Examples of larger laundry equipment suitable for hospitals, public baths, etc., were to be seen on J. J. Lane's stand.

Some domestic applications of electricity were indicated in a prefabricated house which H. Newsum, Sons & Co., Ltd., are producing for Canada. The kitchen was equipped with a Jackson cooker and a Marco refrigerator. Electric space heating was represented by panel fires, convectors, radiators and overhead heaters on the Bratt, Colbran stand.

Street Lighting

The importance of electricity in the field of public lighting was emphasized in a paper presented by Mr. C. C. Smith, Liverpool city lighting engineer. Covering much the same ground as that given at the annual conference of the Association of Public Lighting Engineers of which he is president, the paper discussed the essential requirements of adequate maintenance.

Tubular street lighting columns were included in Stewarts & Lloyds' display, while the Stanton Ironworks Co., Ltd., had examples of pre-stressed spun concrete columns. A range of Horstmann time switches covered hand and electrically wound models and synchronous models, with or without spring reserve. A 28-day repair service for all controller and time switch repairs is offered by Bright, Son & Co. (Clerkenwell), Ltd. With its "Rythmatic" ripple control system for centralized remote switching of street lights, etc., the Automatic Telephone & Electric Co., Ltd., exhibited "Electro-matic" vehicle actuated road signals, as well as inter-office telephone systems.

In view of the new regulations governing pedestrian crossings, flashing beacons attracted a good deal of attention. In the Bergo models the new flexible beacon globe incorporated is almost unbreakable and will withstand fairly high temperatures. Accompanying it were "Bergolite" external floodlights, "Bergomaster" illuminated guardposts and the new "Crisis" illuminated bollard. The Gowshall "50" illuminated guardpost has no protruding components and is especially simple, safe and cheap to install and maintain. The new Franco fluorescent lighting fittings for advance direction and other signs represent a fresh approach to the problem of traffic sign illumination.

The treating, measuring and recording of water and sewage offer further scope for electricity. A chemical reagent feeder was among electrically operated devices shown by Wallace & Tiernan, Ltd. With electrical recorders made by the Lea Recorder

was a new audible water level indicator. Various types of pedestrian controlled refuse collection vehicles were displayed by Bristowes Machinery, Ltd. ("Bristowes-Electruk"), the Harborough Construction Co., Ltd. ("Harbilt") and Sidney Holes Electric Vehicles ("Manulectric").

Lightweight compact v.h.f. radio equipment as now being used extensively by police and fire services, fleets of taxis, public utilities, industrial concerns, ships, etc., was demonstrated by Marconi's Wireless Telegraph Co., Ltd., with a particular view to interesting contractors in the advantage of the system for communication with their agents on sites and for giving instructions to drivers of cranes, tractors, bulldozers and lorries.

Chemical Plant Control

INSTRUMENTS and control gear for chemical plant were dealt with in general terms in a paper presented by Messrs. A. Thompson and W. T. Thomas to the Manchester Association of Engineers. The object of trying to render processing as nearly as possible automatic was said to be the desire to obtain a greater quantity of the final product, of finer quality, from a given plant, or to lower its running cost without having to expend more capital.

The paper briefly explained the functions of the measuring unit, or detecting element, whose indications were converted into power impulses for transmission to regulating units in different parts of the plant, some of the variety of devices employed for these purposes being outlined. Apart from the benefits mentioned earlier, instrumentation might permit some reduction of labour, even though it might necessitate increasing the maintenance staff. The use of recording instruments could indicate incipient trouble and assist the planning of repair work in advance; they could also assist the more accurate allocation of costs of materials to the right departments and so might be regarded as part of the plant costing system.

Belfast Transport

GRADUALLY the trams in Belfast are being replaced by trolley-buses and petrol driven buses. By the end of the present month, most of the tram rails will have been removed, except in the Shankill Road, Crumlin Road and one or two other approaches to busy industrial centres and to the Queen's Island shipyards. A few of the trams will be kept for service during the peak hours of the day, or for emergency services, but early in the New Year all the roads will be served by trolley-buses and petrol buses.

Coronation Celebrations

A CIRCULAR (79/52) has been sent by Mr. Harold Macmillan, Minister of Housing and Local Government, to all local authorities in England and Wales informing them that he has given a general sanction to their "reasonable expenses" in connection with any of their local Coronation celebrations. The circular also gives advice on many other aspects of local celebration.

To assist local authorities, trade organizations and industrial consumers in planning Coronation lighting schemes, a comprehensive display of floodlighting and Coronation lighting units lent by a number of manufacturers was held in the grounds of the Surrey Sub-Area headquarters, South Eastern Electricity Board, at Dorking from Monday to Saturday last week. In addition to floodlighting the main building in three colours, trees were also picked out in colour to give a background to a range of decorative Chrysaline crowns, Tudor roses, shields, thistles and lanterns. Many of the units were mounted in the form of bannerettes and set-pieces at the front of the building to give a general idea of the adaptability of each unit. Kaleidoscopes, butterflies and peacocks, animated animals and floral designs also created a pleasing effect, but perhaps the most attractive feature of the whole display was the fountain with wrought iron gates in the rear. These permanent features, including the water, were specially treated with a new range of fluorescent colours and activated by a battery of Strand u.v. lanterns.

New London Trolley-buses

THE re-equipment of a number of London Transport's trolley-bus routes in the south-western area with new 8ft wide vehicles will be completed this month when a final batch of 50 take the place of the remaining standard 7ft 6in vehicles. Though the seating accommodatoin is the same (70) the extra width will make for greater comfort and ease of movement. The scheme was started in 1948 when 77 new vehicles took the place of the 56-seater pioneer trolley-buses which London United Tramways introduced in 1931.

The routes concerned serve an area from Shepherds Bush and Hammersmith to Hounslow, Twickenham, Hampton Court, Surbiton, Kingston and Wimbledon. All the new vehicles will operate from London Transport's Fulwell and Isleworth depots, which will be equipped entirely with this type. The standard vehicles released will be used to replace some of the older trolley-buses, among them a number of 60-seater vehicles in north and south-east London.

Commerce and Industry

British Productivity Council

College Catering Installation

THE British Productivity Council has now been formally established. The new organization is on a broader basis than its predecessor, the United Kingdom Section of the Anglo-American Council on Productivity, whose work it is taking over as well as engaging in fresh activities. In addition to representatives of the British Employers' Confederation, the Federation of British Industries and the Trades Union Congress—the constituent bodies of the A.A.C.P. since its inception 3½ years ago—the Council includes representatives of the Association of British Chambers of Commerce, the National Union of Manufacturers and the nationalized industries. Each of the participating bodies will subscribe directly to the funds of the Council. Subject to the approval of Parliament a Government grant will also be available.

Sir Peter Bennett (Joseph Lucas, Ltd.) was appointed chairman of the Council at its first meeting in London last week. Mr. Lincoln Evans (Iron & Steel Trades Confederation) was appointed deputy chairman. Sir Peter Bennett was formerly a joint chairman of the United Kingdom Section of the A.A.C.P. and Mr. Lincoln Evans was one of the joint chairmen of the A.A.C.P.

Among the members of the Council are Sir Norman Kipping (F.B.I.), Mr. A. G. Stewart (Stewart & Lloyds, Ltd.), Mr. J. Tanner (Amalgamated Engineering Union), Sir Vincent Tewson (T.U.C.), Mr. F. T. Jackson (National Union of Manufacturers; and Telephone Mfg. Co., Ltd.), and Lord Citrine (British Electricity Authority).

All communications for the British Productivity Council should be addressed to 21, Tothill Street, London, S.W.1 (Whitehall 1671).

South African Broadcasting Order

An order worth £250,000 has been awarded to Marconi's Wireless Telegraph Co., Ltd., through Marconi (South Africa), Ltd. It will give complete broadcasting coverage to the Union of South Africa. The network of nine 20 kW high frequency transmitters will be centred on one site at Paradys, near Bloemfontein. The new system will be additional to the existing medium frequency transmitters already serving part of the Union.

Portsmouth's New Catering College

On 24th October the Duke of Edinburgh opened the new extension of the Municipal College, Portsmouth. The extension includes one of the largest and most up-to-date catering sections in this country, which will deal with the training of cooks, chefs and catering people from Portsmouth and district. Benham & Sons, Ltd., working in co-operation with the Portsmouth City Architect's Department, designed and equipped the kitchens, which besides being used for teaching will also provide a direct cafeteria service for students. The scheme is planned on the lines of a commercial restaurant or hotel, the only difference being that the electric and gas cooking apparatus is arranged to facilitate group instruction. An interesting feature of the fish fryer is that the back has been utilized to act as a large blackboard. Among the electrical equipment installed are three pressure

"Cavendish" electric range units installed at Portsmouth Technical College

steamers; a griller and salamander; a double deck pastry oven; five single "Cavendish" range units; and a "Hercules" dish-washing machine.

F.B.I. Register

The 25th edition of "F.B.I. Register of British Manufacturers—1952–53," now published, is recognized as a standard export reference book to British industry. A foreword is contributed by Sir Archibald Forbes, president of the Federation of British Industries, and its 922 pages comprise seven sections: the aims and activities of the F.B.I.; products and services (a classified buyers' guide listing over 6,000 F.B.I. member firms under more than 5,000 alphabetical trade headings); advertisement section; addresses section (alphabetical directory of member firms); trade associations; brands and trade names; and trade marks. It is published for the F.B.I. by Kelly's Directories, Ltd., and Iliffe & Sons, Ltd., Dorset House, Stamford Street, London, S.E.1, at 42s (post free).

Industrial Atomic Power

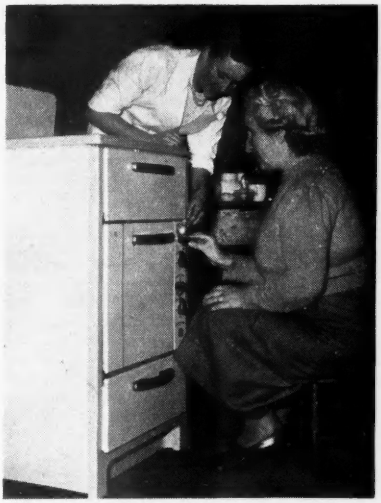
Last week a conference of representatives of Canada and the United Kingdom was held at Harwell to discuss technical policy for atomic energy. The conference discussed the immediate and future objectives of the two countries' programmes on the industrial application of atomic energy, the economics of nuclear power production and the production of special materials required for these programmes.

Electrical Supervisors

A revised edition of the brochure of the Association of Supervising Electrical Engineers describing its objects, membership qualifications and benefits has been issued to take account of the new rules, which came into force on 1st July. Membership is now open to mechanical engineers having electrical responsibilities. The Association aims at meeting the wish of the Institution of Electrical Engineers by providing an association for technicians in the utilization section of the electrical industry which promotes educational and other appropriate activities.

Cookers for the Blind

A cooker, specially designed for use by blind people, was demonstrated recently by the Glasgow Sub-Area of the South West Scotland Electricity Board in co-operation with the Mission for the Outdoor Blind. The demonstration, which was the first of its kind in the west of Scotland, was attended by forty ladies, all blind, who showed keen interest in the cooker and in the dishes prepared by the demonstrator, Miss A. J. Bryce. The use of a pressure cooker was also demonstrated. The heat controls of the cooker, which is produced by the G.E.C., are



Miss A. J. Bryce demonstrating a cooker specially designed for use by blind people

designed to enable the operator to "hear" the temperature settings—a clicking sound is made by the dial at each 50 deg. When the oven has reached the desired heat, a bell rings and a small indicator button, below the control dial, moves out. This button returns flush with the cooker only after the oven has been switched off and has become cold. The coot of the cooker is the same as for the ordinary type, the special blind fittings being installed by the manufacturers free of charge.

Minister at Reyrolles

During a recent industrial tour on Tyneside, Mr. Duncan Sandys, Minister of Supply, visited the Reyrolle works, Hebburn. He saw the extensive production facilities available and, among a wide variety of switchgear, some of the first units of the 275 kV air-blast switchgear for the British super grid.

Export to South Africa

Writing in the "E.C.C. Institute News," Mr. W. M. B. Furniss, assistant managing director of the Electric Construction Co., Ltd., says that for some time the company has been very concerned with the position as regards exports to South Africa because their representatives there are permitted a twelve-monthly quota which they can expend on the purchase of their products. This quota is extremely small and quite insufficient to enable them to satisfy their customers' demands, the company's sales for the year ended March, 1952, being in fact £100,000 less than in the previous year. As a

natural consequence therefore, in their own interests, E.C.C. representatives have had to ask the company to allow them to purchase electrical equipment from other sources. As this would be very detrimental to the company's interests, he had visited South Africa and had had a concentrated three weeks' discussion with the various directors and leading engineers there, as a result of which it was hoped that the flow of the company's products into South Africa would be maintained.

Labour-Saving Houses

The first flat to be completed on Bristol Corporation's Hartcliffe housing estate has been equipped to show a typical example of the modern home in which electrical appliances make the housewife's task easier and more economic. The kitchen contains a modern cooker with thermostatic oven control, a quick-boiling kettle, a table-top refrigerator, a small washing machine which fits under the draining board, and an electric clock. The new dwellings are provided with a power point in every room. There is also a point for an immersion heater.

Provision of electricity supplies to the twin "neighbourhood units" of Hardcliffe and Bishopsworth South, which will form almost a new satellite town with a population of nearly 20,000, will necessitate the laying of nearly 28 miles of h.v. and l.v. cable and the installation of about 20 substations. It is expected that there will ultimately be 3,500 dwellings and shops on the Hartcliffe estate and 1,750 at Bishopsworth.

Winding Engine for the N.C.B.

The General Electric Co., Ltd., announces that a contract has been placed with its Fraser & Chalmers Engineering Works for an electrically driven winding engine by the National Coal Board, South Western Division No. 2 Area. This equipment is to replace the steam winding engine at the Glyncorrwg Colliery and when in operation will deal with 270 tons of coal per hour from a depth of 1,800ft. The weight of coal lifted at each wind will be 6 tons. The motor and switchgear for this engine are being provided from the G.E.C. works at Witton.

Southern Rhodesian Exhibition

A selective exhibition of current British industrial design will be one of the main features of the United Kingdom Pavilion at the Rhodes Centenary Celebrations at Bulawayo, Southern Rhodesia, in June, 1953, which will be visited by Queen Elizabeth, the Queen Mother. The British Council has been invited by the Commonwealth Relations Office to stage this display, and has appointed an advisory panel which will supervise the selection of exhibits. In preparing this exhibition the British Council will work in close collaboration with the Board of Trade and with the Council of Industrial Design.

At its first meeting the panel drew up a list of the main industries that it would like to see represented if space permits. The list includes radio equipment and electric light fittings. The two Councils urge manufacturers to submit as soon as possible (and not later than 15th December) evidence, by photograph or flat sample, of their latest and best work. Submissions should be addressed to "Design Review," Council of Industrial Design, Tilbury House, Petty France, S.W.1. Inquiries about the exhibition should be made to Mr. Wyndham Goodden, British Council, 2-6, Bainbridg Street, New Oxford Street, W.C.1.

Prices of Materials

In the accompanying table we give the prices of the more important materials used in the electrical industry. The figures are those quoted on Monday last.

ALUMINIUM Ingots	ton £166 0s 0d
COPPER, H.C. Electro	ton £285 0s 0d
Fire Refined 99·70 per cent ..	ton £282 10s 0d
Fire Refined 99·50 per cent ..	ton £274 0s 0d
COPPER Tubes	lb 2s 8¾d
Sheet	ton £339 0s 0d
H.C. wire and strip	ton £317 15s 0d
LEAD, English	ton £98 5s 0d
Foreign	ton £97 0s 0d
MERCURY	flask £65 0s 0d
TIN	ton £956 0s 0d
ZINC, G.O.B. Foreign	ton £110 0s 0d
Electrolytic	ton £114 0s 0d
BRASS Tubes	lb 2s 2¾d
Sheet	lb 2s 5¾d
Wire	lb 2s 8⅝d
PHOSPHOR BRONZE	
Wire	lb 4s 1¼d
RUBBER, No. 1 R.S.S. spot ..	lb 22¾–23¼d

More Steel for Factories

Allocations of constructional steel for the first quarter of 1953 include an increase of about 15 per cent in the supply for factory construction and improvement.

Commercial Travellers' Benevolence

The annual Court of Governors of the Commercial Travellers' Benevolent Institution will be held at the Berners Hotel, Berners Street, London, W.1, on 29th December.

Training for Industry

An exhibition indicating the part played by the City & Guilds of London Institute in its advancement of technical education has for the past fortnight been held at the Goldsmiths' Hall, Foster Lane, London. It was opened by the Duke of Edinburgh and will continue until this evening. Displays of special electrical interest include a demonstration of the frequency compression method of achieving

economy in speech transmission, selection of v.h.f. radio waves, remote position servo-mechanism, network analysers, strain gauge indicators and calibrating apparatus, heat transfer in cross-flow heat exchangers, measurement of heat transfer and an electronic engine indicator.

Engineering Wages Claim

In an endeavour to persuade the engineering employers to increase their offer of a 7s 4d a week addition to wages, representatives of the Confederation of Shipbuilding and Engineering Unions met the employers on 6th November. They were told that the offer could not be increased and decided to consult their Executive Council upon the next step. It was announced on the following day that it had been decided to accept the offer. This decision followed the acceptance by the Confederation of the shipbuilding employers' offer of an increase of 7s 6d a week in shipbuilding employees' wages.

Ulster Supply Workers' Wages

Following rejection of their claim for a wage increase of 3d per hour, workers of the Joint Industrial Council for the Northern Ireland Electricity Supply Industry arranged for a mass meeting of their members to be held to consider the next step. The unions concerned are the Electrical Trades Union, the Amalgamated Engineering Union, the Amalgamated Transport and General Workers Union and the National Union of General and Municipal Workers. The employers, in rejecting the claim, contended that such an increase would lead inevitably to further rises in tariffs " with consequent harmful effects to both industrial and domestic consumers."

Student Apprenticeship Scheme

The management of E. K. Cole, Ltd., has announced an extension to the existing apprenticeship scheme to cover an additional grade—that of student apprentice. The object of this new scheme will be to provide a more general training than that now available at present, which will fit the student apprentice for an appointment in the " Ekco " engineering works or office staff. Student apprenticeships will be open to present " Ekco " apprentices of eighteen years or over with the necessary qualifications. A limited number of student apprenticeships will be available to outside applicants.

Electronic Computers

It was recently implied in the *Manchester Guardian* that some years must elapse before large electronic computing machines become commercially available in this country. The suggestion is dealt with in a letter from Mr. B. V. Bowden, of Ferranti, Ltd., who says that while it may be some years before copies of the " Ace " machine can be bought on the open market large computers are already in full-scale production by his company. Mr. Bowden gives brief particulars of these machines and says, among other things, that the " Ferut " computer is to begin its career by working out the flow of water down the new St. Lawrence seaway as a necessary preliminary to the constructional work. " At one time it seemed likely that the computation would occupy all the available facilities in Canada for twenty years or more but we now expect that Ferut will do the job in a matter of a few hundred hours."

Iron and Steel Bill

The Iron and Steel Bill now before the House of Commons provides for the eventual winding-up of the Iron and Steel Corporation set up under the 1949 Act and its replacement by a " holding and realization " agency. The latter body will have the duty of returning to private ownership the undertakings of the companies which were nationalized by the 1949 Act and it will promote the efficient direction of the companies until the change is effected. General supervision of the industry will be exercised by an Iron and Steel Board appointed by the Minister of Supply.

Unusual Ballroom Lighting

On 24th October the Eastern Electricity Board held its annual ball at the Carlton Hotel, Newmarket, attended by officials and employees of the Board from the Fens Sub-Area. An unusual feature was the colour-changing fluorescent ballroom lighting and, on the balcony, a " mural " 35 ft long by 5 ft high

At the Eastern Electricity Board's Ball. (Left to right): Lt.-Col. A. E. Knight (district manager, Fens Sub-Area), Mr. E. Norfolk (Thorn Electrical Industries, Ltd.), and Mr. A. Forester (E.E.B. resident manager at Newmarket)

depicting an amusing horse racing episode which, during the evening, occasionally glowed in the light of ultra-violet fluorescent tubes. This was planned, designed and executed by Thorn Electrical Industries, Ltd., and installed by the Newmarket Branch of the E.E.B. under the direction of the resident manager, Mr. A. Forester. The mural was painted by Keystudios, London.

Henley Students' Conversazione

The annual students' conversazione of the Henley Organization was held at the Woolwich Polytechnic on 8th November. Mr. W. F. Bishop, C.B.E., presided and the chairman of the Henley Organization, Sir Montague Hughman, received the guests and presented the year's awards to students. An address was delivered by Mr. Stuart Hibberd, formerly chief announcer of the B.B.C. and the thanks of the students for the excellent educational facilities provided by the Henley companies was voiced by Mr. Alan Pine, one of the students. Tea was provided and there was a display of students' work, an arts and crafts show and demonstrations of unusual hobbies. Mr. C. H. Harris (works manager, Henley Tyre & Rubber Co.) presented a challenge trophy and awards for students' handicrafts and later a dramatic presentation "I Knew Him When . . . ." (by Mr. F. Davis, Research Laboratories) was staged. The conversazione was organized by a committee comprising Messrs. G. O. Allerston, A. S. Brewer, F. Davis, H. C. Hoban, P. C. Howell, R. D. McAvoy, F. H. Ponder, W. J. H. Seager and D. J. Swadkin.

Electric Roller Heater

We are asked to state that the tube making machine, incorporating a Metrovick electric roller heater, described in our issue of 17th October, was built at the works of the General Engineering Co. (Radcliffe), Ltd.

Trade Announcements

The **London Electric Wire Co. & Smiths, Ltd.**, and its associated companies, Frederick Smith & Co., the Liverpool Electric Cable Co., Ltd. and Vactite Wire Co., Ltd., announce the appointment of Mitchell Cotts & Co. (Far East), Ltd., as their sole selling agents for Malaya, Singapore, Siam, Sarawak and British North Borneo. The chief office of Mitchell Cotts & Co. is at Lee Rubber Buildings, High Street, P.O. Box 40, Kuala Lumpar, Malaya.

Herman Smith Smithlite, Ltd., announces the appointment of Mr. G. T. L. Nash as its representative for Derbyshire, Staffordshire and Shropshire. Until recently Mr. Nash was with Crompton-Parkinson, Ltd., Birmingham. Mr. D. I. Wiggans has been appointed to cover Leicestershire, Nottinghamshire and Lincolnshire.

Catalogues and Lists

Edison Swan Electric Co., Ltd., 155, Charing Cross Road, London, W.C.2.—Catalogue of Ediswan "Clix" accessories including revised price list.

Stephen Glover & Co., Tudor House, Bridge Street, Walsall, Staffs.—"Verglo" conduit fittings and wiring accessories catalogue (VG.2).

Petbow, Ltd., Sandwich, Kent.—Illustrated brochure depicting the current range of "Petbow" engine-driven welding plants, with price list.

A. & S. Osmond, Ltd., 254/6, Hotwell Road, Bristol, 8.—Three illustrated folders on "Osmond" high-speed tile cutting and cut-off machines.

Linolite, Ltd., 118, Baker Street, London, W.1.—Leaflets (C.11 and D.12) illustrating the company's complete range of decorative lighting fittings, together with current price list.

M.T.E. Control Gear, Ltd., Leigh-on-Sea, Essex.—General catalogue (114 pp.) illustrating the company's range of control gear, relays, variable speed drives, etc.

General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.—Illustrated priced folder on "Osram" fluorescent tubes and starter switches (OS.1833).

Hume Atkins & Co., Ltd., 66, Victoria Street, London, S.W.1.—Broadsheet of fluorescent lighting fittings, including price list.

Sturtevant Engineering Co., Ltd., Southern House, Cannon Street, London, E.C.4.—Publication 4706 dealing with industrial drying.

Thorn Electrical Industries, Ltd., 105-109, Judd Street, London, W.C.1.—"Atlas" fluorescent lighting handbook (including price list) and an illustrated broadsheet relating to fluorescent lighting units.

Information Department

THE extensive records of our Information Department enable us to reply to most queries, but occasionally we ask for our readers' assistance in tracing names and addresses not known to us. We should be glad to have such information regarding the makers of the following:—

"Maison" and "Interdee" bedside table lamps.

General inquiries from readers relating to sources of electrical goods, makers' addresses, etc., are replied to by the Information Department through the post. Inquiries should be accompanied by a stamped addressed envelope.

Power System Operation

New Electronic Telemeter Described at I.E.E. Meeting

AT an Ordinary meeting of the Institution of Electrical Engineers in London last week, Messrs. R. H. Dunn and C. H. Chambers (both of Standard Telephones & Cables, Ltd.) presented a Measurements Section paper dealing with telemetering for power system operation. They began by outlining the requirements of power system control engineers in respect of telemetered intelligence to facilitate load despatching, pointing out that the main telemetering problem for system control was to provide sufficient information of acceptable quality with due regard to capital and maintenance costs.

The authors then discussed the various problems associated with the provision of these continuous readings and showed that telemetering systems which operate over any appreciable distance should be based on a variable frequency, and an impulse-frequency arrangement gave the greatest flexibility. Although such a system is not capable of handling readings of all possible quantities, it can indicate load, voltage, current, frequency and can repeat readings from other known systems which change some value into a voltage.

Performance of Equipment

Impulse transmission lent itself to time-sharing multiplex arrangements which obtained the maximum economy in bandwidth and line rental. In the view of the authors, electronic systems had now reached a stage of reliability which permitted their use for power system control. Cold cathode tubes of long life were available and in use, and development was proceeding rapidly. Electronic techniques had passed the stage of special engineering, and equipments were presented in a form suitable for quantity production with interchangeability.

The authors gave a detailed description of this new electronic telemeter system and explained that it had advantages with regard to response and accuracy, and permitted several simultaneous readings over a restricted bandwidth. Equipments of this type had received field trials and were now in commercial use.

DISCUSSION

Mr. F. J. Lane (B.E.A.), who opened the discussion, said that as a side issue to the paper it might be asked why more use was not made of power line carrier and radio. Briefly, the answer lay in the small dimensions and high population density of this country. The 132 kV supply system included nearly 300 substations with an average spacing of less than twenty miles, involving heavy cost and complication. In the radio field, while experimental and emergency facilities might be practicable, the general use of radio for control purposes was not permitted. However, there was a well maintained public communications system and it had been possible to obtain an economic control network, the good performance of which was very well illustrated by the prominence given to the occasional failure.

Mr. N. C. Smart (G.E.C.) observed that up to the present time relays, which wore out and required maintenance, had been used. Electronic devices should give much longer trouble-free life.

Mr. P. J. Squire (B.E.A.) said that unfortunately accuracy and quick rate of response did not go together, but the new type of telemeter circuit which, it was understood, would give quick response under changing conditions while retaining a long-time constant under set conditions with associated accuracy was a very welcome development.

Mr. P. F. Gunning (B.E.A.) said that the pulse modulated telemeter and its associated electronic distributor should be considerably cheaper. One advantage which had been lost with the adoption of the new system was the preservation of telemetering under mains failure. It could only be done by means of battery driven or diesel driven prime movers to energize the comparatively high voltage electronic power packs. On

the whole, however, the new system might be regarded with great expectations.

Mr. R. E. Martin (B.E.A.) said that one of the difficulties in using electronic equipment was the provision of the necessary high voltage: the use of cold-cathode tubes was obviously an advantage in that respect because they reduced the power consumption of the whole equipment. To provide the 600 V supply, he suggested either the use of a dry-cell battery floated across the power pack to maintain the supply to the equipment in the event of temporary failure or the use of heavy duty vibrators in gasfilled hermetically sealed cans.

Mr. W. Brittlebank (Merz & McLellan) referred to the question of response time of a telemeter, and said that to minimize running costs many authorities were turning to fully remote control of hydro stations. Generally the distances involved and the type of signalling channels employed precluded the use of direct reading instruments, and generators had to be loaded on information derived from telemeters. Therefore the response time of a telemeter assumed rather a new significance.

Mr. F. Byrne (B.E.A.) said that communications could profit from the meter engineers' experience of the possibilities and the limitations of measurement and, conversely, much could be learned from telephone relay technique in the design of summation systems. The demands of the communications engineer had imposed some problems on the meter engineer, the chief of which was the need to impart a regularity to the re-transmitted impulses received in random fashion by a summator. He concluded by calling attention to some quaint specimens of terminology which had emerged from the scheme.

Water-Turbine Governors

A GENERAL picture of closed-sequence systems of controlling hydro-electric plant, covering the relation between governors and water level, power, frequency and tie-line control, was presented in a paper prepared by Mr. N. G. Dennis (chief hydraulic research engineer, English Electric Co., Ltd.) for the Institution of Mechanical Engineers.

Different types of water-turbine governors were examined, special mention being made of the governing difficulty created by the inertia of the water column in the pipe line, followed by an analytical description of the miscellany of devices incorporated into governors of this kind (including centrifugal devices and their drives, hydraulic and mechanical addition and subtraction, pilot relays, distributing valves and servomotors, temporary return-motion and acceleration-sensitive devices). Simultaneous control of guide vanes and runner vanes, or guide vanes and relief valve, or spear and diffuser or deflector was explained, while various arrangements for supplying pressure oil to small and large governors were mentioned.

The paper was mainly analytically descriptive, but it concluded with a description of an actual governor and an appendix contained a brief theoretical analysis of behaviour.

Canadian Trade Drive

THE Canadian Association of British Manufacturers and Agencies (C.A.B.M.A.), formed with the support of the Dollar Export Council, the Dollar Sterling Trade Council, the Association of British Chambers of Commerce, the Federation of British Industries, and the National Union of Manufacturers, has as its sole purpose the development of British trade with Canada. By arrangement with the Association, Iliffe & Sons, Ltd., and Kelly's Directories, Ltd., are jointly publishing in June, 1953—and thereafter annually—the first officially sponsored directory of British manufacturers and exporters whose products and services are available in the Canadian market.

The "CABMA Register" will have six sections, its many thousands of carefully classified entries providing exhaustive references to the names, addresses, proprietary names and trade marks, products and services of British manufacturers and exporters actively engaged in trade with Canada (including Newfoundland). No charge will be made for standard entries. A glossary in French-English will add to the volume's utility.

The Register will reach the most influential buyers and importers throughout Canada. Six thousand copies of the first issue are to be published; the C.A.B.M.A. organization will undertake the distribution of 3,000 against specially selected lists; the selling price for the balance will be two guineas a copy.

The advertisement section is open to all British manufacturers and exporters whose products are sold in Canada through associate companies and agencies, or direct to buyers, and to Canadian organizations concerned with the furtherance of Canadian-United Kingdom trade. Details are obtainable from Iliffe & Sons, Ltd., Dorset House, Stamford Street, London, S.E.1. Mr. F. G. Montfort Bebb, assistant managing director, Iliffe & Sons, Ltd., is leaving immediately for Canada to discuss the final plans for launching this project.

ELECTRICITY SUPPLY

Proposed New Cyprus Authority

Representations Against South Wales Tariff

A BILL gazetted in Nicosia authorizes the setting up of a Cyprus Electricity Authority whose main objects will be to provide for the generation and supply of electricity at reasonable prices; to encourage the use of electricity particularly in agriculture and industry; and to promote the development of the island's natural resources. At present electricity supply is mainly in the hands of private and municipal undertakings which will be acquired by the new Authority. It is proposed that the Authority shall consist of four members, to be appointed by the Governor, who will hold office for five years. The first stage of the island-wide grid scheme begun about three years ago and estimated to cost £4 million is now nearing completion.

Inadequate Installations

Complaints by tenants of new houses that no provision is made for electric cooking were mentioned by Councillor A. J. Illing at a recent meeting of Winslow (Bucks) Rural District Council. He said that some people moving in already had electric cookers and these could not be fitted. It was explained that to cut housing costs, only gas was provided for cooking: electric cooker panels were expensive to install. The matter was referred to the Housing Committee which was authorized to install electric power if thought necessary.

Argyll Hydro-Electric Scheme

A scheme prepared by the North of Scotland Hydro-Electric Board to meet the increasing demand for electricity in the Oban area by developing the water power resources of Loch na Sreinge, Loch Tralaig, the River Oude and tributary streams in the Kilmelfort district of Argyllshire has been confirmed by the Secretary of State for Scotland, Mr. James Stuart. It is estimated that 9 million kWh per annum will be produced. Under the scheme two dams will be built, one to raise the level of Loch Tralaig and the second to form a headpond in the Pass of Melfort, and the water will be led by tunnel and pipeline to a generating station (installed capacity 3,000 kW) on the right bank of the River Oude above Melfort House. Water will also be diverted from the Allt Braglenmore to Loch Tralaig by impounding Loch na Sreinge, and part of the Eas Tarsuinn will be diverted to the headpond in the Pass of Melfort. The scheme is estimated to cost £458,000.

New Plant for York

The British Electricity Authority has received the consent of the Minister of Fuel and Power to the installation in York power station of a 20 MW turbo-alternator set and two 100,000 lb hr boilers, in replacement of the plant which was destroyed when a boiler exploded in the station in October, 1949.

Directory of Undertakings

The 1952–53 edition of "Electricity Undertakings of the World" (the "Red Book"), published by Benn Bros., Ltd., 154, Fleet Street, E.C.4 (price 30s), contains 3,000 more place names, with details of electricity supply, than in the preceding edition. The matter has been brought up to date and various improvements to facilitate reference have been introduced. One addition is a section dealing with the power supply side of British Railways.

Protest Against New Tariff

A protest against the revised domestic electricity tariff of the South Wales Electricity Board is to be lodged by the Cardiff Corporation Parliamentary Committee. At a meeting of the committee last week it was decided that formal representations should be drafted for eventual submission to the South Wales Electricity Consultative Council. Copies will be sent to the Minister of Fuel and Power, to the three Cardiff M.P.s, and to the Wales Gas Consumers' Council.

Sir William Williams said that the great majority of people in Cardiff, especially those in smaller houses, used gas for cooking. It had been estimated that there were between 40,000 and 50,000 gas stoves in the city. Unless electricity were used for cooking and immersion heating it was impossible to avoid the bulk of consumption being charged at the basic rate of 5d per kWh. It meant that many Cardiff people, particularly those with limited incomes like retired persons and old age pensioners who were doing their best to economize, were being charged 5d per kWh for lighting—something which was essential. He added that the

increased use of electricity by consumers who wanted to take advantage of the 0·85d rate which followed the basic charge would mean a heavier peak load at difficult times and new power stations would be needed to meet the demand.

The city treasurer, Mr. R. E. Davies, said that the increase to the old "all-in" tariff consumers was not so great as it was to those who were on the old flat rate. If the flat rate tariff had been left as an alternative much would have been done to alleviate the hardship suffered by smaller consumers.

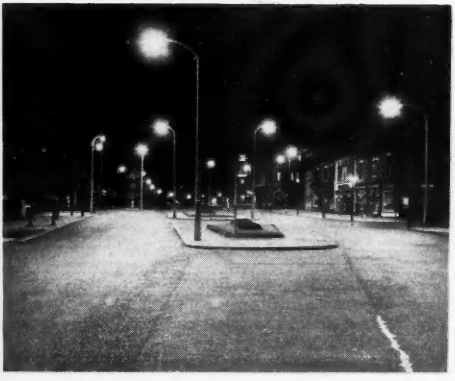
When one committee member suggested that Cariff should seek the co-operation of other South Wales local authorities, it was stated that those authorities were not suffering in the way that Cardiff was. Some were actually benefiting under the new tariff.

The Gas Consumers' Council was included in the Committee's resolution after the town clerk had stated that the Minister co-ordinated the work of both Gas and Electricity Boards and that formal representations on the electricity tariff should be addressed to both consumers' councils.

Trunk Road Lighting

Although carrying a very heavy load of industrial and private traffic from Lancashire to Carlisle and N.W. Scotland, the A6 trunk route was, until recently, very inadequately lit. In parts the carriageway is narrow and the route passes through many built-up areas and large towns. First class group "A" installations, using fluorescent, mercury and sodium lamps, have now reduced to only four miles the previous total of 28 miles of poorly-lit or unlighted road in densely built-up areas. All the recent installations have been equipped with lanterns, lamps and control gear supplied by the General Electric Co., Ltd., which also handled some complete contracts, although the North Western Electricity Board were the main contractors for the majority of the installations. For the greater part of the route "Osram" 140 W sodium lamps in G.E.C. lanterns were chosen, with 400 W mercury units at Stockport, Kendal and Lancaster, and three-lamp, 80 W fluorescent units for the town lighting of Chorley and Kendal.

The A6 trunk route at Worsley lit by "Osram" 140 W sodium lamps in G.E.C. lanterns



Street Lighting Plans

NORTHAMPTON Corporation Highways Committee reports that tenders have been invited for the conversion of the lighting in certain streets from gas to electricity.

Subject to Ministry of Transport approval, SWADLINCOTE U.D.C. is to carry out the fourth stage of its street lighting electrification plan, at an estimated cost of £3,700.

BARRY (Glam) Corporation has accepted the quotation of the South Wales Electricity Board for the installation of Group "A" street lighting along approximately 3¼ miles of classified roads within the borough.

"Unnecessary Waste"

Fulham Works and Highways Committee is concerned at the "unnecessary waste of manpower and money" involved in breaking open the recently reconstructed carriageway in Townmead Road to lay a 66 kV cable and has made a strong protest to the British Electricity Authority. The Committee, in its report, points out that the reason for the reconstruction, carried out at substantial expense by the Council, was the breaking up of the road by numerous trenches, mainly in connection with the electricity undertaking. It considers that the present proposal could have been avoided by proper foresight and co-operation with the Council.

Facilities for Electric Cooking

As the result of the acceptance by the Kensington Borough Council of an offer by the London Electricity Board, tenants of a new block of flats at Denbigh Road Westbourne Greve will have the choice of electric or gas cooking. The Board offered to install adequate rising mains at its own expense if the Council would wire each flat for lighting, utility points, immersion heater and cooker circuits. Reporting this, the *Kensington News* recalls that in the case of the recently erected block of flats at St. Charles Square the Council refused to install electric cooker control panels on the grounds that comparatively few people preferred electric to gas cooking and it would be more economical to equip each flat for gas only. This policy gave rise to a "storm of protests" from tenants who wanted to cook by electricity and had to pay the cost of installing the control panels themselves.

Modern Lighting Laboratory

Benjamin Electric's New Facilities

MANY years ago the Benjamin Electric, Ltd., installed and equipped one of the first commercial photometric and illumination laboratories. Developments, both in the lighting art and in the company's business, demanded more extensive facilities and so the company decided to build a new engineering and research block at Tottenham to house its design and laboratory staff.

The company's architects, Messrs. Charles M. Swannell, F.R.I.B.A., and K. F. Templeman, A.R.I.B.A., co-operated with the staff in preparing the plans. Much special apparatus has been installed, largely designed and manufactured by the engineering and works staff, to suit the special test conditions required for their products. This new establishment has been completed and is now claimed to be the most up-to-date and completely equipped laboratory of its kind.

Its primary function is to develop lighting fittings and lighting technique for industry. In addition to research and development work, a constant check is maintained by the staff on the optical and physical quality of the reflectors produced in the works and provision has been made for all measurements in the physical, optical and mechanical fields.

The new building comprises engineering, administrative and design offices, a prototype workshop and stores, a main laboratory area of 2,000 sq ft with a ceiling height of 22ft and sundry smaller laboratory test rooms of a special nature.

The offices house all the technical files and data and a library of reference and text books. Prototypes of new designs are made up in the workshop and are held ready to be tested in the laboratory for illumination and electrical characteristics. The range varies from the smallest local

Our title picture shows the new Benjamin research building. The stairway on the left leads to weathering test racks on the roof. *Below:* **Main laboratory area showing three high-bay units prepared for test. In the background is the 12ft photometric integrating sphere**

reflector to the largest tungsten fitting, fluorescent trough or floodlight, and all their relevant lampholders and components. A switchboard distributes a.c. and d.c. supplies to all parts of the laboratories and transformers give a range of voltages.

The main laboratory is equipped with photometers of various types for measuring light distribution and intensity, for the calibration of lamps and meters. Perhaps the most impressive piece of apparatus is the large photometric integrating sphere, 12ft in diameter and weighing 2 tons.

The laboratory floor is divided into 3ft squares and travelling gantries on the ceiling span the whole of this area. A number of test fittings can thus be suspended at any spacing and any mounting height and their resulting illumination measured at any point.

In the smaller laboratory rooms, more specialized tests are carried out. One is equipped for instrument tests and for ascertaining the electrical characteristics of fittings; another, with a draught-proof cubicle, is for temperature tests on lamp caps and incoming cables. In another heavily lagged test room any climatic condition can be simulated, from hot and wet to cold and dry, and from the heaviest tropical rains to the softest dew.

Apart from the integrating sphere already mentioned, the equipment includes a polar co-ordinate photometer, a cartesian co-ordinate photometer, a reflectometer, paint test apparatus, and a glass strain viewer.

Domestic Water Heating

RESULTS of an investigation into the use of water-heating appliances in domestic establishments during the summer are given in a report (National Building Studies, Special Report No. 11) published by H.M. Stationery Office for the Department of Scientific and Industrial Research (3s). The objects of the inquiry were to determine the distribution of existing hot-water appliances and facilities; the relation between the consumption and use of hot water and the appliances available; and the amount of hot water adequate for the average household.

It has been found that the estimated weekly requirement for a household of four persons is between 250 and 300 gallons of water at 140 deg F, but at the time of the survey nearly two-thirds of households were using only about half of this quantity or less, partly owing to the absence of facilities and partly because of cost.

In general, appliances are found to be more satisfactory for summer water heating than for winter use, but the "space-heating" propensity of many appliances causes serious inconvenience. Among the "piped" appliances the immersion heater is considered satisfactory by the highest proportion of housewives (88 per cent of those having them) both in summer and winter, though the number possessing them is relatively small. These heaters are usually installed in conjunction with a solid fuel appliance; rather more than one-third are used every day in winter and two-thirds in summer.

A great deal of other information is given and analysed in the report on the use of solid-fuel, gas and electrical appliances. One appendix quotes figures, provided by the British Electricity Authority, which show that the proportion of households with electric storage heaters is 2·2 per cent, those with immersion heaters 5·4 per cent and those with electric "coppers" 3·6 per cent.

"Underground" Car Reconditioning

LONDON "Underground" stock was designed for a life of 30 years, but the "F" class cars, built by the Metropolitan Carriage & Wagon Co. in 1920–21, are in such good structural condition and so well able to fulfil operational requirements that they are being retained for a further ten years. Their retention, however, entails some heavy reconditioning outside the scope of normal overhaul work, and the 99 cars of this class are therefore being passed through the reconstruction shop at the Acton Works. The most important of the work being undertaken is the renewal of all electric power cabling and control wiring, except for a small amount installed comparatively recently. To improve reliability and ease maintenance the non-standard drivers' brake controllers of the original pattern are being replaced by self-contained standard units from tube cars. To improve passenger amenities a number of other measures are being adopted.

Electricity in Ireland

Presidential Address by Board's Chief Engineer

IN his recent presidential address to the Institution of Civil Engineers of Ireland, Mr. P. G. Murphy (chief engineer, Electricity Supply Board, Dublin) spoke of electrical development in Ireland.

Domestic consumers, he said, were the biggest users, taking 42 per cent of the output, compared with 33 per cent for industrial power. The supply to rural consumers, although only 6 per cent of the kWh sold last year, was as great as the country's total use of electricity 25 years ago. The production of 345 kWh/head of population last year, compared with 735 kWh in Holland and 590 kWh in Denmark, both small agricultural countries, indicated that there was considerable scope for future development in Ireland.

Since 1930 the demand for electricity had doubled every 5 to 5½ years, which might be due to the fact, said Mr. Murphy, that their utilization level was still relatively low. Whether such a high rate would continue in the future would depend to a large extent on economic conditions as well as on national policy affecting such things as the financing of new electricity supply extensions, the growth of industry and the use of native fuel.

Power Resources

It was unlikely that any new major source of electrical energy would be found in Ireland in the near future. Research was in progress into the development of wind power, but that was intermittent and had considerable limitations, while the use of atomic energy also appeared to be a long-term prospect. The potential useful output from hydro power development in Ireland was about 900 million kWh a year. The Shannon, Liffey and Erne accounted for 560 million kWh and future hydro development would bring 340 million kWh.

The total production of native coal, 174,000 tons last year, was only about 8½ per cent of the country's present coal consumption. The production of peat on a large scale by mechanical means was now mainly for electricity generating stations, the consumption this year being estimated at 300,000 tons of sod peat. A decision had been made to produce the peat fuel for future stations in the form of "milled peat" having a moisture content of about 55 per cent compared with the present sod peat moisture content of about 30 per cent. This decision would involve radical changes of both the peat production method on the bogs and of the fuel preparation and firing systems in the power stations.

Rate of Development

Mr. Murphy said that if the present rate of the growth of electricity demand continued, generation in 1957–58 would be about 2,000 million kWh and 4,000 million kWh about 1963. When a 4,000 million kWh demand was reached 11 years hence, or much later, only 900 million kWh could be obtained from water power. The balance of 3,100 million kWh must be produced from fuel. Expressed in tons of fuel this would be equivalent to 7 million tons of milled peat, 4 million tons of sod peat, 2 million tons of coal, or 1,334,000 tons of oil.

Fortunately, said Mr. Murphy, the electricity supply engineer was not called upon to anticipate conditions as far ahead as 1963, but it would be necessary to decide on new generating plant about five years in advance. At present the capacity of hydro and steam plant was about equal, but by 1956–57 the proportion of steam plant would have risen to 65 per cent of the total and hydro plant fallen to 35 per cent of the installed capacity.

Research in Universities

THE Department of Scientific and Industrial Research has compiled a directory of scientific research in British universities (H.M. Stationery Office, 8s 6d). This sets out in brief detail the nature of research and the names of those conducting it at 65 universities and university colleges. Subjects range from agriculture to surgery and include many electrical and engineering subjects. An alphabetical "author index" gives the names of those mentioned in the body of the volume.

FINANCIAL SECTION

Company Notes and Stock Exchange Activities

Reports and Dividends

Falk, Stadelmann & Co., Ltd., report a group trading profit, including sundry income, for the year ended 31st March last of £662,419, as compared with £572,541 for the preceding year, and after meeting all charges, including £234,850 for taxation, the net profit of the parent company is £105,834 (against £93,764), to which is added £75,928 brought in, £3,690, reserve no longer required, and £1,500, surplus on sale of freehold property, making a balance available of £186,952. It is proposed to place £25,000 to reserve for contingencies, and to transfer £10,000 to staff pension and benevolent fund. The proposed final ordinary dividend is 5 per cent, again making 15 per cent for the year, and the balance carried forward is £81,486.

In his circulated statement, Mr. H. Falk (chairman and managing director) states that the turnover has again broken all records. Trading for the first six months of the current year shows a small reduction in sales. The company's premises in Wellington, N.Z. were gutted by fire in July last, but temporary premises were secured and trading has not been completely interrupted. They are continuing to concentrate on the export side of the business. A factory is being built in South Africa for the production of some of their specialities, and new premises are being erected in Johannesburg as the existing premises are inadequate to cope with the expansion of their organization in that territory. One of their main warehouses in London, adjacent to the head office, is being rebuilt.

The report and accounts include photographs of fluorescent lighting installations in which the company's fittings have been installed, and of the West-End showrooms in Mount Street, W.1.

The Perak River Hydro-Electric Power Co., Ltd., reports a revenue for the year ended 31st July last of £1,266,709, as compared with £1,138,781, and after meeting all charges, the balance carried to net revenue account is £764,626 (against £675,154). A sum of £250,000 is allocated for depreciation, and taxation absorbs £381,839, leaving a net profit of £132,777 (£164,201), to which is added £100,626 brought in, and provisions no longer required, £207,500, making a total available of £440,903. General reserve receives £75,000, and it is proposed to pay the preference dividends for the eight years to 31st July, 1952. The balance carried forward is £103,403.

In his circulated statement, which accompanies the report and accounts, Mr. H. G. Balfour (chairman) says that the peak load on the system for the year under review was 57,000 kW, as compared with 53,700 kW in the previous year. Electricity generated rose by 4 per cent to 367 million kWh, of which 227 million was generated at the Chenderoh hydro-electric station, 98 million at Malin Nawar steam station, and 42 million at Batu Gajah steam station. There was an increase during the year in the number of incidents of sabotage by terrorists. Supply was interrupted on 26 occasions by interference with transmission lines, and on 11 occasions equipment on consumers' premises was damaged by fire. No acts of sabotage occurred during the last two months of the year under review. The number of tin dredges connected to the system increased from 32 to 35, and they consumed 133 million kWh. The gravel pump mines connected fell from 127 to 124, and the total consumption decreased from 155 to 146 million kWh.

Tube Investments, Ltd., reports a trading profit (subject to audit) for the year ended 31st July last of £9,056,595, as compared with £7,431,189 for 1950-51, to which is added other income of £235,239, making £9,291,834. Of this taxation absorbs £5,879,675, and outside interests £23,189, leaving a net balance of £3,388,970 (against £2,979,162). Stock reserves of subsidiaries receive £500,000, and the amount retained by subsidiaries is £381,994. General reserve receives £1,430,754, and dividend stabilization reserve £200,000. It is proposed to pay a final ordinary dividend of 7½ per cent and an adjusting dividend of ¾ per cent. With the interim of 13½ per cent paid before the recent 100 per cent capitalization of £3,424,302 of reserves, the total for the year is equivalent to 15 per cent on the increased capital of £6,848,604. For 1950-51 the distribution was 25 per cent in equal interim and final payments.

Thomas De La Rue & Co., Ltd., have announced that no interim payment will be made on the capital of £926,000, as increased by a 100 per cent scrip bonus. The directors state that it is clear that the profit for the current year to 31st March next will be greatly reduced and they consider it improbable that any final dividend will be

recommended. The slight improvement in sales to which the chairman referred at the annual meeting held last July was not maintained. For 1951-52 a final dividend of 15 per cent was paid on the increased capital, and an interim dividend of 20 per cent on £463,000.

The Sun Electrical Co., Ltd., reports a profit for the year to 30th April last, after deducting £53,064 for taxation, of £33,057, as compared with £44,249 for the preceding year. General reserve receives £10,000 and it is proposed to maintain the dividend for the year at 15 per cent. The balance carried forward is £61,699 (against £50,912 brought in).

Switchgear & Cowans, Ltd., propose to make an issue of ordinary shares to ordinary shareholders and to create and issue debenture stock. The net proceeds of the two issues are estimated at £244,250. The ordinary issue will consist of 100,000 5s shares to be offered at 10s per share in the proportion of one new share for every six held. Advanced arrangements are already in progress for the creation and issue of £200,000 5½ per cent first mortgage debenture stock at par. This stock is finally repayable on 31st December, 1977, at 102 per cent, but the company has the option of repayment in whole or in part at 104 per cent from 1st January, 1968, to 31st December, 1972, or at 103 per cent from 1st January, 1973, to 30th December, 1977.

The British Oxygen Co., Ltd., has obtained Treasury consent to raising approximately £3.75 million, and is making a rights issue to ordinary stockholders, who are offered 1,873,315 new £1 ordinary shares at 40s each in the proportion of three new shares for every £10 ordinary stock held. The new shares will rank for any final dividend declared for the year to 31st December next.

Oliver Pell Control, Ltd., reports a trading profit for the year to 31st March last of £33,193, as compared with £11,562 for the previous year. After adding £29,087 profit on the sale of a factory and other income, and deducting E.P.L. £900 and loss of £52,078 brought in, there is a credit balance carried forward of £2,918.

Burco, Ltd., reports a profit for the year ended 30th September of £54,281, after deducting £92,593 for taxation, as compared with £60,475 in the preceding year. It is proposed to pay a final dividend of 25 per cent making 35 per cent for the year (against 38¾ per cent).

Associated British Engineering, Ltd., has declared an interim ordinary dividend of 5 per cent. The dividend is equivalent to the interim dividend of 10 per cent paid in respect of the year 1951-52, when the issued ordinary share capital stood at £300,000. Since that date it has been brought up to £1,000,000 as a result of a bonus share issue.

Bakelite, Ltd., is paying an interim dividend of 3 per cent on the ordinary shares. The overall amount to be distributed remains the same as last year, as since then the ordinary capital has been doubled by the capitalization of reserves.

Pye, Ltd., has declared an interim dividend on the preferred ordinary stock of 5 per cent actual.

Increases of Capital

Sciaky Electric Welding Machines Ltd.—Increased by £84,150, in 1,683,000 ordinary shares of 1s, beyond the registered capital of £15,850.

English Electric Export & Trading Co., Ltd.—Increased by £90,000, in £1 ordinary shares, beyond the registered capital of £10,000. The English Electric Co., Ltd., hold a majority of the issued shares.

Liquidation

Relco, Ltd., domestic electric appliance exporters.—Winding up voluntarily. Liquidator, Mr. E. Richmond, 6, Bishopsgate, London, E.C.2, appointed 29th October. All creditors will be paid in full.

Bankruptcies

A. S. Fraser, trading as Electrical Maintenance Service Co., 553, Romford Road, Manor Park, E.12, and 1, Shrewsbury Road, Forest Gate, E.7, electrical engineer.—Receiving order made 31st October on a creditor's petition. First meeting to-day (Friday) and public examination 22nd January, both at Bankruptcy Buildings, Carey Street, London, W.C.2.

M. J. Haine and **M. E. Simpson**, trading as Haine & Co., 77, Westbourne Grove, London, W.2, electricians.—Separate estate of M. J. Haine. Last day for receiving proofs for dividend 24th November. Trustee, Mr. F. H. Langmaid, Bankruptcy Buildings, Carey Street, London, W.C.2.

B. A. Murton, carrying on business at 54, The Green, Writtle, near Chelmsford, Essex, electrician.—Last day for receiving proofs for dividend 18th November. Trustee, Mr. W. J. Wallis Hill, 3, Central Buildings, Matthew Parker Street, Westminster, London, S.W.1, Official Receiver.

L. L. O'Connor, trading as Paragon Electrical, at 27, Wellington Square, London, S.W.3, electrical and radio contractor.—First and final dividend of 6d in the £, payable 21st November at Bankruptcy Buildings, Carey Street, London, W.C.2.

STOCKS and SHARES

STOCK EXCHANGE markets have been presented lately with a good deal of important news for assessment, the principal domestic event being the issue, on Thursday of last week, of £120 million stock by the British Transport Commission. The gilt-edged market took this in its stride, and, in doing so, confirmed a growing impression that Government stocks are securing at least a temporary ascendancy over most other forms of securities for present investment purposes. A rather flat reception in Wall Street of the American election results, and uncertainty about how they may react on European affairs, did nothing to rouse the industrial markets from apathy, although the Wycombe by-election helped sentiment. Price changes in the industrial lists are consequently again few, except where individual company news has been a factor.

New Transport Stock

Good timing, and a nice adjustment of the offered terms, assured a satisfactory response to the issue of the new 4 per cent British Transport Stock (redeemable 1972–77) at 95½. The public was invited to subscribe for half the £120 million issued. Dealings began at a small premium; later, the price dwindled to a discount. This new loan fits in well between existing Government issues, and answers the demand for gilt-edged stocks which give the buyer something over 4 per cent on his money, together with the safeguards provided by a fixed date for the repayment of the capital. Among the few "dated" securities which offer terms similar to those of the new Transport Stock is the 4¼ per cent British Electricity Stock, redeemable 1974–79, which can be bought at a fraction under par.

Tube Investments Dividend

The final dividend and profits statement published a week ago by Tube Investments came up to market expectations, the £1 ordinary shares being marked up 6d to 56s 3d. With a final dividend of 7½ per cent, plus an adjusting payment of ¾ per cent, the total for the year is rounded off at the equivalent of 15 per cent on the present capital, as doubled during the course of the year by the 100 per cent share bonus. For five years previously, the distribution had been kept down to the equal of 12½ per cent. The moderate increase this time means no departure from a strictly conservative dividend policy. Ordinary dividends this time absorb £64,000 more at £540,000, but net profits after tax are over £400,000 higher, and well above £2½ million of the surplus is being ploughed back into the business. The tax collector, it may be noted, takes more than ten times as much as the ordinary stockholders receive. A position of outstanding strength is recognized in the yield of an austere 5¼ per cent on the shares.

Falk, Stadelmann Report

Trading profits of Falk, Stadelmann & Co. for the year ended last March are shown in the accounts to have expanded by £50,000, and the net figure is close up to the previous results. This enables the board to declare a final ordinary dividend making a total of 15 per cent (costing £50,000 net this time) for the sixth year running, and again to appropriate well over £100,000 to reserves. As the report points out, the reserves now top the million mark. In aggregate, they are little short of the amount of issued capital, which is made up of £635,250 ordinary and £500,000 preference stocks. There has been little subsequent change in the price of the company's £1 ordinary shares, which stand at 38s 9d to give a yield of 7¾ per cent on the present rate of dividend. Referring to the overdraft of nearly £200,000 which has appeared in the balance-sheet as a corollary to a big rise in stocks, the chairman says that the latter have been appreciably reduced since the beginning of the current year.

Switchgear & Cowans Issue

Switchgear & Cowans have made an issue of 100,000 new ordinary shares of 5s each at 10s per share. Holders are offered one new share in respect of every six old shares held. The old are now quoted at 13s ex rights, and on the new there is a premium of about 4s per share. This makes the value of the rights on the old shares, about 9d per share. In addition to this, the company proposes to make a debenture stock issue of £200,000 in 5½ per cent first mortgage stock at 100, repayable December, 1977, at 102, the company to have the option of repayment at earlier dates from 1968 onwards.

Miscellaneous Matters

De La Rue 5s shares became a rather nominal market at around 7s 6d after the company's decision to pass the interim dividend and the warning that a final payment for the year ending next March is improbable. Profits, it is stated, will be greatly reduced. Holders of Cable & Wireless (Holding) 3 per cent loan stock have until the 21st of this month to accept the company's offer of conversion into the new 5 per cent debenture, 1972–77. In the case of the 4 per cent loan stock, a similar offer is open in respect of half present holdings. Holders of either of these loans, or of the ordinary stock, may apply at par for any debentures remaining after conversion applications have been satisfied. Other things being equal, the debenture is thought likely to be well received in the market.

ELECTRICAL INVESTMENTS

Past Week's Price Changes

Company	Dividend Previous	Dividend Last	Middle Price 10th Nov. 1952	Week's Rise or Fall	Est. Yield p.c. £ s d
Gilt-edged and Overseas Stocks					
Brit. Elec. 1968/73	3	3	84½	—	3 11 0
Brit. Elec. 1974/77	3	3	83	—	3 12 3
Brit. Elec. 1976/79	3½	3½	89½	—	3 18 3
Brit. Elec. 1974/79	—	4½	100	—	4 5 0
Calcutta Elec. ..	6†	6†	20 6	—	5 17 1†
East African Power	7	7	23 -	+6d	6 1 9
Nigerian Elec. ..	10	10	21 3	–	—
Palestine Elec. "A"	5†	Nil	12 6	—	—
Perak Hydro-Elec.	Nil	Nil	14 6	+6d	Nil
Equipment and Manufacturing					
AberdareCables(5/-)	20	20	14 -	—	7 2 10
Aerialite (1/-) ..	83½	88½	8 -	—3d	11 0 10
Allen, W. H. ..	15	15	11 9	—	7 3 9
Aron Elec. Ord. ..	15	15	33 9	—	8 17 9
Assoc. Elec. Ord...	20	20	72 6	—	5 10 6
Automatic Tel. & El.	15	15	56 3	—	5 6 8
Babcock & Wilcox	18	18	68 9	—	5 2 10
Baldwin, H. J. (2/-)	25	20	4 -	—	10 0 0
Bakelite (10/-) ..	—	—	17 6	—	—
British Aluminium	10	12	43/-	—6d	5 11 7
B.I. Callender's ..	7½	9	33 -	—	5 9 1
British Thermostat (5/-)	30	30	27 -	—	5 11 1
British Vac. Cleaner (5/-)	25	25	13 -	—	9 12 4
Brook Motors (10/-)	20	20	28 9	—	6 19 2
Brush Ord. (5/-) ..	10	10	5 -	—	10 0 0
A. F. Bulgin (1/-)..	27½	30	2 6	—	12 0 0
Burco (5/-) ..	38½	35	20 -	—½	8 15 0
Chloride El. Storage	15	15	61 3	—	4 18 0
Cole, E. K. (5/-) ..	25	25*	15 6	—	8 1 4
Cossor, A. C. (5/-)	Nil	10	8 6	—	5 17 8
Crabtree (10/-) ..	17½	17½	32 6	—	5 7 8
Crompton Parkinson Ord. (5/-) ..	11½	11½	9 -	—	6 5 0
De La Rue (5/-) ..	50	35*	7 6	—¼	—
Decca (1/-) ..	112½	112½	17 -	—	6 12 3
Dewhurst (2/-) ..	35	22½*	5 -	+6d	—
Dictograph Tel.(2/-)	20	20	5 -	+3d	8 0 0
E.M.I. (10/-) ..	12	12	14 3	–3d	8 10 0
Electrical Components (5/-) ..	20	20	10 -	—	10 0 0
Elec. Construction	15	15	50 -	—	6 0 0
Enfield Cable Ord.	7½	7½	22 -	—6d	6 16 4
English Electric ..	15	15	55 6	—	5 8 1
Ericsson Tel. (5/-)	22†	22*†	40 -	—	2 12 6†
Ever Ready (5/-)..	35	35	26 -	—6d	6 14 8
Falk Stadelmann	15	15	38 9	—	7 14 8
G.E.C. Ord. ..	22½	22½	42 6	—	5 6 0*
General Cables (5/-)	30	30	14 -	—	10 6 10
Greenwood & Batley	15	15	37 -	—	8 2 2
Hackbridge Cable (5/-)	20	20	11 3	—	8 17 10
Hackbridge Hewittic (5/-)	18	20	16 3	—	6 3 0
Hall Tel. Acc. (10/-)	10	10	10 6	—	9 10 6
Heatrae (2/-) ..	12½	12½	4 -	—	6 5 0
Henleys (5/-) ..	20	20	17 9	—	5 12 8
Holophane (5/-) ..	15	20*	11/3	—	8 17 10
Hoover (5/-) ..	37½	35*	22/6	—	7 15 6

Company	Dividend Previous	Dividend Last	Middle Price 10th Nov. 1952	Week's Rise or Fall	Est. Yield p.c. £ s d
Equipment and Manufacturing (continued)					
Intl. Combustion (5/-)	20	25	22/6	—3d	5 11 0
Johnson & Phillips	15	15	52/6	—	5 14 3
Lancashire Dynamo	22½	12½*	42/6	—	5 17 8
Laurence, Scott (5/-)	12½	15	12/9	—	5 17 8
London Elec. Wire	10	12½	48/9	—	5 2 6
J. Lucas	17½	7½*	34/6	—	4 7 0
Marryat & S. (2/-)	22½	22½	5/-	—	9 0 0
Mather & Platt ..	12½	12½	42/-	—6d	5 19 0
Metal Industries ..	10	15	38/-	—⅛	—
Mid. Elec. Mfg. ..	15	15	53/9	—	5 11 6
Murex	12½	15	53/-	—9d	5 13 3
Newman Ind. (2/-)	6	10	2 3	—	8 17 10
Oldham & Son (1/-)	30	35	2 6	—	—
Parnall (Yate) (5/-)	6	6	4/5	—	7 1 3
Parsons, C. A. ..	15	10*	53/9	—	—
Plessey (5/-) ..	20	22½	19 9	+3d	5 14 0
Pye Deferred (5/-)	18	18	15 3	—	5 18 0
Revo (10/-) ..	27½	27½	41/3	+⅛	6 13 4
Reyrolle	15	10*	47 6	—	—
Scot. Cable (1/-) ..	30	32	10 9	—6d	—
Siemens Ord. ..	10	10	34/-	—	5 17 8
Strand Elec. (5/-)..	17½	17½	8 9	—	10 9 0
Sturtevant (5/-) ..	16½†	17½*†	22 6xb	—	—
Switchgear & Cowans (5/-)	22½	22½	13/-xr	—	—
Taylor T. (5/-) ..	20	20	20/-	—	5 0 0
T.C.C. (10/-) ..	20	20*	37/6	—	—
T.C. & M.	10	10	26/-	—	—
TelephoneMfg.(5/-)	10	10	8/-	—	—
Thorn Elec. (5/-)..	10	12½	8/-	—6d	7 10 3
Tube Investments	25	15*	56/3	+6d	5 6 8
Vactric (5/-) ..	Nil	Nil	3 9	—	Nil
Veritys (5/-) ..	Nil	7½	5 -	+3d	7 10 0
Walsall Conduits (4/-)	70	70	45/-	—	—
Ward & Goldstone (5/-)	45	45*	32/6	—	—
Watford (2/-) ..	25	25	6/3	—	8 0 9
Westinghouse Brake	14	14	48/9	+1 -	5 14 10
West, Allen (5/-)..	12½	15	10/3	—	7 6 4
Trusts, Transport and Communications					
Anglo-Am. Tel.: A Ord. ..	—	6	84½	—2	7 2 0
Ord.	—	3⅜	55	—	6 16 3
Anglo-Portuguese	8	8	20/9	—3d	7 14 3
Brit. Elec. Traction: Def. Ord. ..	22½	25	435	—	5 15 0
Cable & Wireless: Ord.	6	8	124	—	6 9 1
4% Loan ..	4	4	98½	+1	4 1 3
Calcutta Trams ..	6†	6†	21 -	—	5 14 3†
Cape Elec. Trams	5	5½	10/-	—2/-	11 0 0
Marconi Marine ..	10	10	31/-	—	6 9 0
Oriental Tel. Ord.	16	16	57/6	—⅛	—
Telephone Props...	8	8	35/-	+6d	4 11 5
Tele. Rentals (5/-)	10	10	9 -	—	5 11 1

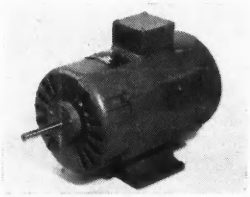
* After capital bonus.
† Dividends are paid free of Income Tax.

RECENT INTRODUCTIONS

Notes on New Electrical and Allied Products

Fractional H.P. Motors

THE F.H. 6 range of motors made by HILLMAN ELECTRIC MOTORS, LTD., 2–3, Northwold Road, N.16, includes machines of from 0·01 to 0·25 h.p. either d.c., single-phase or three-phase induction, or universal. An identical output can be obtained from a.c. or d.c. machines, the universal type being fitted with adjustable brush gear to give maximum output with improved commutation. The machines are largely of die-cast construction and the bearing housings are interchangeable for either ball or plain bearings. These machines can be supplied either totally enclosed or with fan protected ventilation by means of interchangeable inspection covers. A gear box can also be fitted for low speed drives.



One of the Hillman F.H. 6 range of f.h.p. motors

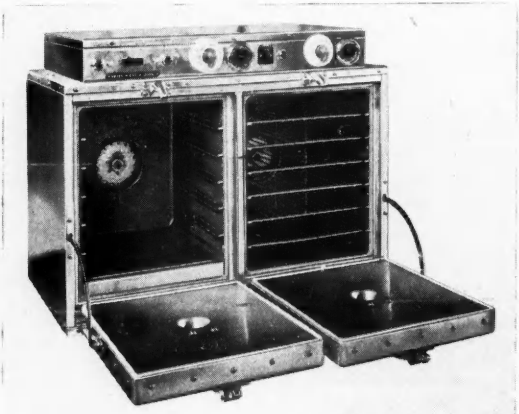
Aircraft Oven

With the HE 38704 oven produced by GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, for use in airliners, sixty meals can be heated simultaneously from their frozen state to serving temperature in 25 minutes. The ovens, which are independently controlled thermostatically, have a running temperature of 200 to 500 deg F, which is attained after only 10 minutes' preheating. Separation into two compartments gives economy of operation if only a small passenger load is carried at any time. Weighing only 88 lb the oven is of stainless steel construction with external aluminium covering. It has a power consumption (maximum) of 4·4 kW at 28 V d.c.

Not only has K.L.M. already placed an order for these ovens, but Trans-Canada Airlines will also use them in their new Super Constellations, thus bringing British galley equipment into North American airline use for the first time. That a British firm has been successful in breaking into such a highly competitive American market is something of which the G.E.C. is justifiably proud. Another order has been received from Pakistan International Airlines.

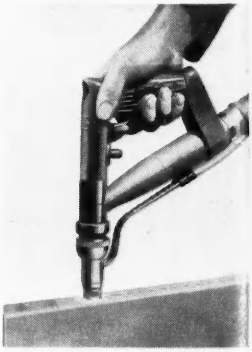
Spot Welding Equipment

The "Argonarc" spot welding process has been introduced by the BRITISH OXYGEN CO., LTD., Bridgewater House, Cleveland Row, London, S.W.1, to meet the need for speedy flux-free spot welding of austenitic steels and also for tack welding in assembly work. The



Left: **G.E.C. double compartment ovens for airliners; circulating fan at back**

Below: **"Argonarc" spot welding torch**



process can also be used for bright mild steel and certain non-ferrous metals.

A feature of the process is that access to one side of the work only is required. The operating cycle is automatic and no skill is required of the operator apart from positioning the torch and working the trigger switch. The equipment is fully transportable and since the arc is screened by the torch nozzle it can be used in any workshop without inconvenience to other workers.

Galvanized Wash Boiler

The GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, London, W.C.2, is again marketing a galvanized wash boiler. Of improved design, having a cast aluminium rim and polished aluminium lid, the new model is attractive in appearance and competitive in price. It has a capacity of 10 gall and a loading of 3 kW, and is fitted with two double pole switches, providing low, medium, and full heat. It is supplied with 6ft of three-core flexible. Overall dimensions of the wash boiler are: height 27in, width 19½in, depth (including tap) 23in. The boiler complies with B.S. 1326. The list price is £10 12s 0d (automatic cut out £1 2s extra).

Sectional Insulating Jacket

A sectional insulating jacket which can be fitted to any type of domestic hot water storage cylinder is now being produced by EETO INSULATIONS, River Street, Bolton, Lancs. Each section consists of a ⅜in layer of "Fibreglass" with a stout canvas backing and a glossy cream plastic exterior. The requisite number of these sections, each of which is 6in wide, is hooked on an extensible ring fitted round the water inlet pipe and bound tightly to the cylinder by flexible black lacquered steel bands. The glossy finish, which is made from Lorival plastic material, is non-inflammable, vermin-proof and hygienic.

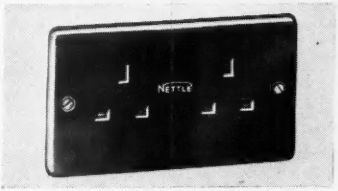
Recent tests have shown that the use of the jacket leads to remarkable reductions in heat losses. In one installation, with a jacketed 20 gall cylinder connected to a circulating boiler with Eeto-lagged pipes, it was found that nearly 76,000 B.Th.U. was saved in keeping the water at 140 deg F for 24 hours.

Left: **Sectional plastic covered insulating jacket (Eeto Insulations) fitted on typical domestic hot water storage cylinder**

Right: **Quasi-Arc 20/600 A or double 20/300 A welding equipment**

Two-Gang Socket Outlet

A two-gang 3-pin 13 A shuttered socket outlet is now being made by NETTLE ACCESSORIES, LTD., Harper Road, Wythenshawe, Manchester. Although it is designed for flush mounting, it



Nettle two-gang 3-pin 13 A socket outlet

can be arranged for surface fixing in conjunction with a pattress. In addition, the company is producing the 13 A switch and shuttered socket outlet which will also accept plugs made in accordance with B.S. 1363.

Welding Equipment

The QUASI-ARC CO., LTD., Bilston, Staffs, has redesigned its ACP 2/300 transformer welding plant to have an output of 20/600 A for one operator or 20/300 A for each of two operators. This enables fabricators to weld with heavy electrodes at 600 A and, when necessary, to convert the plant into two 300 A units for the general run of welding work. The plant is compact, of streamlined design and is readily portable; the current selector controls on the top of the equipment are easy to read and provide welding output on 80 or 100 Vopen circuit.

NEXT WEEK'S EVENTS

Monday, 17th November

BRISTOL.—S.W.E.B. Offices, Colston Avenue, 6 p.m. I.E.E. Western Centre Supply Group. "The Economics of Low-Voltage Electricity Supplies to New Housing Estates," by F. G. Copland.

CHESTER.—Town Hall, 6.30 p.m. I.E.E. Mersey & North Wales Centre. "Inherent Current, Voltage and Speed Control in Dynamo-Electric Machinery," by J. C. Macfarlane, Dr. J. W. Macfarlane and W. I. Macfarlane.

KINGSBURY.—Prince of Wales Hotel, 8 p.m. A.S.E.E. North-West London Branch. "Main Line Traction," by C. C. H. Wade.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Informal Meeting. Discussion on "The Field of Application of Metal Rectifiers," opened by S. A. Stevens.

Grocers' Hall, E.C.2, 7 for 7.30 p.m. Old Centralians. Annual dinner.

NEWCASTLE-ON-TYNE.—King's College, 6.15 p.m. I.E.E. North-Eastern Radio and Measurements Group. "Microwave Radio Links," by Dr. A. H. Star. and T. H. Walker.

Tuesday, 18th November

DERBY.—Electricity Service Centre, 6.30 p.m. I.E.E. East Midland Centre. Discussion on "The Problems Associated with the Application of Electronics in Heavy Industry," opened by H. E. Knight.

GLASGOW.—Grosvenor Restaurant, 6 p.m. I.E.E. Scottish Centre. Dinner-dance.

LIVERPOOL.—Merseyside & N. Wales E.B., Whitechapel, 6 p.m. I.E.S. Liverpool Centre. "The Design of Interior Lighting Equipment," by L. H. Hubble.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Measurements and Radio Sections. "Harmonic Response Testing Apparatus for Linear Systems," by D. O. Burns and C. W. Cooper.

Magnet House, Kingsway, W.C.2, 6.30 p.m. Association of Supervising Electrical Engineers. "Research on and Development of Crystal Rectifiers and Amplifiers and their Use as a Tool in Industry," by R. W. Douglas and Dr. E. G. James. (Joint meeting with the Institution of Engineers-in-charge.)

RUGBY.—College of Technology & Arts, 6.30 p.m. I.E.E. Rugby Sub-Centre. "275-kV Developments on the British Grid System," by D. P. Sayers, Dr. J. S. Forrest and F. J. Lane.

ST. ALBANS.—Peahen Hotel, 7.30 p.m. Incorporated Plant Engineers, Hertfordshire Discussion Group. "Plant Repair by Welding," by K. K. Doherty.

Wednesday, 19th November

BIRMINGHAM.—Chamber of Commerce, New Street, 7.30 p.m. Institution of Engineering Inspection, Birmingham Branch. "The Use of Hard Chrome Plating in Engineering," by C. Wharrad.

BRISTOL.—Electricity House, 7 p.m. I.E.E. Bristol Students' Section. "Electrification of Railways," by S. A. Kandil.

COVENTRY.—Coventry Technical College, The Butts, 7.15 p.m. A.S.E.E. Coventry Branch. "Development in Fluorescent Lamps," by L. J. Hill.

LEEDS.—Hotel Metropole, 7.30 p.m. Institution of Heating and Ventilating Engineers, Yorkshire Branch. "Atmospheric Pollution," by E. M. Birtwistle.

MANCHESTER.—Engineers' Club, Albert Square, 7 p.m. A.S.E.F. Manchester National Lecture. "Power Factor Correction", by F. L. Johnson.

MIDDLESBROUGH.—Cleveland Scientific and Technical Institution, Corporation Road, 6.30 p.m. I.E.S. Tees-Side Group. "Flash Discharge Tubes."

PRESTON.—49a, Fishergate, 7.15 p.m. I.E.S. North Lancashire Group. "Industrial Lighting," by W. Imrie-Smith.

ROCHESTER.—Bull Hotel, 7 p.m. Incorporated Plant Engineers, Kent Branch. "Can Additives in Lubricating Oil help the Plant Engineer? " by A. V. Driver.

SHEFFIELD.—Grand Hotel, 6.30 p.m. I.E.E. Sheffield Sub-Centre. "The Use of Electricity in a Modern Iron and Steel Works," by W. F. Cartwright.

WIMBLEDON.—The Guild House, 32, Worple Road, 8.15 p.m. A.S.E.E. South-West London Branch. "Scientific Thought." by Dr. L. E. C. Hughes.

Thursday, 20th November

BLACKBURN.—Chamber of Commerce, Richmond Terrace, 7.30 p.m. Incorporated Plant Engineers, Blackburn Branch. "The Care and Maintenance of Diesel Equipment," by J. W. Armstrong.

CARDIFF.—Park Place, 6.30 p.m. South Wales Institute of Engineers. "Scientific Research in the Mining Industry," by Dr. W. Idris Jones.

DUBLIN.—Trinity College, 6 p.m. I.E.E. Irish Branch. "Condensers and Power Factor Improvement," by J. J. Morrissey.

EXETER.—Imperial Hotel. Exeter Electric Club. Visit from Mr. Cavendish-Laird. Followed by "Twenty Questions."

GLOUCESTER.—2, St. Aldate Street, 6.15 p.m. I.E.S. Gloucester and Cheltenham Centre. "Lighting in Relation to Safety and Vision," by E. W. Murray.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Utilization Section. "Electricity in Farm Crop-Drying," by C. A. Cameron Brown and P. G. Finn-Kelcey.

Caxton Hall, Westminster, 2.30 p.m. Diesel Engine Users' Association, "Torsional Vibration in Diesel Engines —Some Observations and Practical Aspects," by C. H. Bradbury.

MAIDSTONE.—Royal Star Hotel, 8 p.m. A.S.E.E. Kent Branch. "The Principles underlying the I.E.E. Wiring Regulations," by J. J. Looker.

RUGBY.—The Laurels Club, Duncharch Road, 7.30 p.m. I.E.E. Rugby Sub-Centre Students' Section. Film evening, by F. Szekely.

Friday, 21st November

BIRMINGHAM.—Midland Hotel. Institution of Heating and Ventilating Engineers, Birmingham and District Branch. Annual dinner.

COVENTRY.—G.E.C. Ballroom. I.E.E. South Midland Students' Section. Annual dance.

GLASGOW.—At the Institution of Engineers and Shipbuilders in Scotland, 39, Elmbank Crescent, C.2, 6.45 p.m. Iron and Steel Institute, West of Scotland Branch. "The Production of Steel Tubes by the Electrical Resistance Weld Process," by Dr. J. S. Blair.

LIVERPOOL.—9, Whitechapel, 7.30 p.m. A.S.E.E. Liverpool Branch. "Developments in Fluorescent Lighting and Dimming Control," by Dr. Ballin.

LONDON.—Feathers Hotel, Broadway, S.W.1, 5.45 p.m. Electrical Trades' Commercial Travellers' Association. Annual general meeting.

Townsend House, Greycoat Place, 7 p.m. Junior Institution of Engineers. "Some Comparisons between Shell and Water Tube Boilers," by J. N. Williams.

MANCHESTER.—Grand Hotel. Incorporated Plant Engineers, East Lancashire Branch. Annual dinner.

STONE.—Crown Hotel, 8 p.m. I.E.E. North Staffordshire Sub-Centre. Annual dance.

TINTERN.—Beaufort Arms. Newport and District Electric Club. Dance.

Saturday, 22nd November

HULL.—Y.E.B. Offices, Ferensway, 2.30 p.m. I.E.E. North Midland Students' Section. Chairman's Address "A Survey of the Administrative and Engineering Practice within the Distribution Industry," by G. A. Haigh.

MANCHESTER.—At the Geographical Society, 16, St Mary's Parsonage, 2.30 p.m. Junior Institution of Engineers, North Western Section. "Industrial Instrumentation," by F. H. Auger.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s 8d each including postage) will be obtainable after 17th December from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1943

15498. Sperry Gyroscope Co., Inc.—Electrical amplifying systems. 21st September, 1943. (684948.)

1946

11328. Standard Telephones & Cables, Ltd.—Radio remote control systems. 12th April, 1946. (684949.)

12451. Standard Telephones & Cables, Ltd.—High-altitude antenna. 18th April, 1946. (684749.)

21438. Sperry Gyroscope Co., Inc.—Thermionic valve amplifying systems. 21st September, 1943. Divided out of 684948. (684950.)

1947

18832. Sperry Gyroscope Co., Inc.—Electrical phase measuring apparatus. 15th July, 1947. (684831.)

1948

2388. Philips Electrical, Ltd., and Botterill, A. R.—Electromagnetic chokes. 29th January, 1948. (684751.)

21195. Egyesiilt Izzolampa es Villamossagi Reszvenytarsasag.—Process of refining glass electrically. 15th September, 1948. (684911.)

1949

322. Bendix Aviation Corporation.—Signal radiating apparatus more particularly for atmospheric sounding. 5th January, 1949. (684601.)

6004. Bendix Aviation Corporation.—Electromagnetic signal generators. 4th March, 1949. (684755.)

7256. Platt Bros. & Co., Ltd.—Electrically operated stop-motion means for looms for weaving tufted pile fabrics. 17th March, 1950. (684604.)

12532. Fielden (Electronics), Ltd., and Fielden, J. E.—Electrical measuring apparatus. 1st May, 1950. (684761.)

17352. General Electric Co., Ltd., Davidson, J. A., and Dudding, R. W.—Methods of settling organic films on concave surfaces, especially for cathode-ray tubes. 29th September, 1950. (684577.)

19882. Radio-Industrie Soc. Anon.—Systems and apparatus for producing television pictures for viewing in relief. 28th July, 1949. (684679.)

20107. Philips Electrical, Ltd.—Electric-discharge tubes. 2nd August, 1949. Addition to 681355. (684680.)

24168. Bryant Chucking Grinder Co.—Variable-frequency power supply system. 20th September, 1949. (684914.)

26375. Walsall Conduits, Ltd., and Court, R. A. B.—Electric pin-plug connectors. 16th October, 1950. (684915.)

27738. Staatsbedrijf der Posterijen, Telegrafie en Telefonie.—Signalling system and signalling device. 28th October, 1949. (684608.)

32233. Radio Corporation of America.—Audio limiter circuits. 15th December, 1949. (684612.)

32540. National Research Development Corporation.—Electric discharge producing apparatus. 4th December, 1950. (684613.)

1950

205. British Thomson-Houston Co., Ltd.—Steam rons. 4th January, 1950. (684617.)

1891. Baker, L. G.—Telephone message recorders and call answering arrangements. 24th January, 1951. (684772.)

3275. General Electric Co., Ltd., and Espley, D. C.—Relay stations for use in radio communication systems. 8th February, 1951. (684693.)

3650. Eversbed & Vignoles, Ltd.—Electrical recording apparatus. 1st May, 1951. (684775.)

5002. Victor Products (Wallsend), Ltd.—Electrical plug and socket connectors. 27th February, 1951. (684778.)

5695. C.A.V., Ltd.—Dynamo-battery system. 21st February, 1951. (684855.)

7768. General Electric Co., Ltd., and Hamer, E. G.—Electric amplifier arrangement of the kind which includes a magnetic amplifier. 21st March, 1951. (684626.)

9186. Ferranti, Ltd.—Spindles for yarn-spinning and twisting frames. 13th April, 1951. (684629.)

9581. Flynn, G.—Circuit tester for testing the electrical circuits of motor vehicles and the like. 19th April, 1951. (684858.)

9784. Directie van de Staatsmijnen in Limburg.—Electrical fusion butt-welding. 20th April, 1950. Addition to 671115. (684631.)

11010. Allday & Son (1922), Ltd., H., and Bain, R.—Protective means for electric plug and socket connectors. 24th April, 1951. (684702.)

11054. Plessey Co., Ltd.—Thermionic valve holders. 19th April, 1951. (684703.)

11799. Soc. d'Electronique et d'Automatisme.—Electric wave amplifiers. 11th May, 1950. (684862.)

14270. Branson, J. C. S., and Branson, L. C.—Amplifying devices for use with telephone apparatus. 1st June, 1951. Addition to 646589. (684633.)

14471. Soc. Générale d'Electronique.—Television image projector. 9th June, 1950. (684706.)

15902. Marcoz, J. A. E.—Automatic electric circuit breakers. 26th June, 1950. (684868.)

16145. English Electric Co., Ltd.—Permanent-magnet generators. 8th June, 1951. (684786.)

16282. Igranic Electric Co., Ltd.—Control systems for ignition-tubes. 29th June, 1950. (684787.)

18054. Associated Electrical Industries, Ltd.—High-vacuum pumps. 1st June 1951. (684710.)

19332. General Electric Co., Ltd., and Scoweroft, J.—Telephone party line metering systems. 7th June, 1951. (684637.)

19814. Standard Telephones & Cables, Ltd.—Mechanical joints for electric cables. 3rd August, 1951. (684713.)

21089. Radio Corporation of America.—Transistor amplifiers having frequency responsive variable gain. 25th August, 1950. (684879.)

21355. British Thomson-Houston Co., Ltd.—Stationary induction apparatus. 29th August, 1950. (684921.)

22189. Hoover, Ltd.—Suction cleaners. 8th September, 1950. (684880.)

22731 & 23459. Igranic Electric Co., Ltd.—Electric motor control systems. 15th and 25th September, 1950. (684881/2.)

23712. Sylvania Electric Products, Inc.—Electric discharge lamps. 27th September, 1950. (684717.)

24102. Storey, A. G. G.—Electrically live wire fencing. 1st October, 1951. (684922.)

26502. Westinghouse Electric International Co.—Anode assemblies of X-ray tubes. 31st October, 1950. (684796.)

28357. Bendix Aviation Corporation.—Cathode-ray tube indicator arrangement. 20th November, 1950. (684724.)

28481. Tesla, Narodni Podnik, and Vana, J.—Thermionic valve. 21st November, 1950. (684725.)

29891. Industrial Distributors (1946), Ltd.—Electrodes for the electrostatic separation of minerals. 6th December, 1950. (684928.)

30366. Sylvania Electric Products, Inc.—Secondary electron emitting electrodes. 12th December, 1950. (684726.)

30445. British Thomson-Houston Co., Ltd.—Means for initiating the arc in a mercury-pool tube. 13th December, 1950. (684727.)

30535. British Thomson-Houston Co., Ltd.—Dynamo-electric machines. 14th December, 1950. (684929.)

30581. Marconi's Wireless Telegraph Co., Ltd.—Thermionic valve amplifier stages of the cathode-follower type. 13th August, 1951. (684803.)

31052. Bendix Aviation Corporation.—Detachable electrical connections. 20th December, 1950. (684804.)

31174. Marconi's Wireless Telegraph Co., Ltd.—Neutralizing circuits for high-frequency push-pull connected multi-grid valve amplifiers. 17th August, 1951. (684805.)

1951

952. Standard Telephones & Cables, Ltd.—Electromagnetic waveguides. 12th January, 1951. (684887.)

2325. British Thomson-Houston Co., Ltd.—Wave generators. 30th January, 1951. (684648.)

3101. Standard Telephones & Cables, Ltd.—Failure alarm arrangements for communication systems. 8th February, 1951. (684889.)

3875. Klangfilm Ges.—Thermionic valve amplifiers. 16th February, 1951. (681895.)

5277. Pierce Foundation, J. B.—Thermally operated circuit breakers. 5th March, 1951. (684736.)

5559. Soc. Anon. de Telecommunications.—Device for signalling the blowing of a fuse, for amplification stations in telecommunications. 7th March, 1951. (684899.)

6798. Sperry Corporation.—Synchronizing apparatus for electrical oscillations. 15th July, 1947. Divided out of 684831. (684901.)

6877. Hunter, T. M.—Rotary-electric welding transformers. 22nd March, 1951. (684817.)

7716. General Aniline & Film Corporation.—Liquid density measuring attachment for photo-electric densitometers. 3rd April, 1951. (684818.)

7895. Westinghouse Electric International Co.—Induction heating. 5th April, 1951. (684819.)

8299. British Thomson-Houston Co., Ltd.—Methods of brazing, particularly methods of brazing resistor terminals. 10th April, 1951. (684739.)

11316. British Thomson-Houston Co., Ltd.—Supporting frames for clothes-washing mechanism. 15th May, 1951. (684656.)

12315. Philco Corporation.—Non-linear electrical circuit element. 25th May, 1951. (684907.)

13216. General Electric Co., Ltd., Puckette, jun., C. C., and Scowcroft, J.—Impulse sender of the type used in telephone systems. 31st March, 1952. (684657.)

14618. Van Der Heem, N. V.—Small rotary electric machines and a method of assembling same. 20th June, 1951. (684902.)

14637. British Thomson-Houston Co., Ltd.—Temperature-responsive devices in liquid cooled electrical apparatus. 20th June, 1951. (684943.)

16187. Eisemann Ges.—Electric hair dryers. 9th July, 1951. (684744.)

17618. Philips Electrical Industries, Ltd.—Frequency modulation receivers with silent tuning. 25th July, 1951. (684658.)

17619. Philips Electrical Industries, Ltd.—Frequency modulation receiving circuit arrangements. 25th July, 1951. (684659.)

17798. Winther, M. P.—Magnetic pole pieces for dynamo-electric machines. 27th July, 1951. Addition to 658311. (684745.)

22939. Radio Corporation of America.—Colour television image reproduction. 2nd October, 1951. (684664.)

IMPORTS OF N. RHODESIA

THE values in 1951 of the principal electrical lines imported into Northern Rhodesia are given below with notes of increases or decreases on the previous year. There was a decline only in telegraph and telephone instruments. Trade as a whole expanded by about 10 per cent on 1950. Competition from the Union of South Africa was especially noticeable in cables and batteries, but Great Britain's share generally was about three-quarters of the total value.

Class of Goods	1951 £ (000)	Inc. or dec. on 1950 £ (000)
Lamp bulbs, electric	47	+ 12
From United Kingdom	30	+ 11
„ S. Africa	8	—
Telegraph and telephone instruments and apparatus*	82	— 49
Radio apparatus and parts	140	+ 19
From United Kingdom	93	+ 5
„ S. Africa	25	+ 9
„ S. Rhodesia	18	+ 4
Cable and wire	480	+ 36
From United Kingdom	286	+ 8
„ S. Africa	192	+ 26
Batteries	107	+ 25
From United Kingdom	49	—
„ S. Africa	56	+ 25
Other elec. machinery and material	1,160	+ 142
From United Kingdom	956	+ 97
„ S. Africa	145	+ 63
„ United States	36	— 26

* Mainly from United Kingdom.

SOUTH AFRICAN TRADE

THE latest monthly abstract of trade statistics of the Union of South Africa shows that electrical imports during the first quarter of this year increased by about 55 per cent in value on the corresponding period of 1951. Cable and wire, other than rubber insulated, furnished the only exception to the advance in imports.

Class of Goods	Jan.-March 1951 £ (000)	Jan.-March 1952 £ (000)
Batteries and parts	123	232
Dynamos and generators	98	264
Motors	425	555
Transformers	258	455
Cable and wire (rubber insulated)	108	193
Cable and wire (other)	302	259
Elec. stoves and parts	43	110
Lamp bulbs	77	126
Radio apparatus and accessories	253	502

Countries of origin are not specified by individual groups, but about 75 per cent of the total imports were from the United Kingdom.

Exports of electric cable and wire during the first quarter were valued at £248,000, against £287,000, and of machinery and parts, not agricultural, £404,000 compared with £348,000 in the corresponding period of 1951.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Brazil.—PARA.—15th January. State Government. Plant for a new power station. (C.R.E. 37122/52. Ten/5077.)*

Chippenham.—1st December. South Western Regional Hospital Board. Rewiring of St. Andrew's Hospital. (See this issue.)

East Riding.—1st December. County Council. Electrical work at secondary school, Cottingham. County architect, County Hall, Beverley.

Edinburgh.—21st November. City Council. Electrical work in 118 houses and 12 shops, Drylaw Mains housing area. City architect, City Chambers.

Heckmondwike.—28th November. U.D.C. Electrical work in 28 houses, Dale Lane estate. J. K. Garlick, surveyor, 6, Church Street.

India.—DELHI.—27th November. Directorate General of Supplies and Disposals. Portable electric grinders. (C.R.E. 36203/52. Ten/5084.)*
CHITTATANJAN. 23rd December. India Stores Dept. Steel tape for telephone cable factory. (See this issue.)

New Zealand.—AUCKLAND.—16th February. Auckland Electric Power Board. Supply of 6,600 V switchgear and associated equipment. (C.R.E. 36988/52. Ten/5040.)*

Portuguese East Africa. — LOURENÇO MARQUES.—27th November. Ports, Railways and Transport Administration. Various electrical equipment. (C.R.E. 36753/52. Ten/ 5076.)*

St. Helens.—1st December. Town Council. Sixty-six street lighting standards with 250 W h.p.m.v. lanterns. Borough engineer, Town Hall.

South Africa. — PRETORIA. — 4th December. Union Tender and Supplies Board. Portable electric drilling machines. (C.R.E. 36916/52. Ten/ 5081.)*

Swanage.—5th December. U.D.C. Electrical installations, Bell Street housing scheme. (See this issue.)

Uruguay. — MONTEVIDEO. — 10th December. Usinas Electricas y Telefonos del Estado. Supply of switches and fuse plugs. (C.R.E. 37110/52. Ten/5068.)*

West Hartlepool.—26th November. Town Council. Electrical installation in new Rossmere County Primary School. Borough architect, Municipal Buildings.

West Riding.—22nd November. County Council. Apparatus for lighting pedestrian crossing beacons. (See this issue.)
1st December. County Council. Renewal of electrical installation at Elland Grammar School. (See this issue.)

ORDERS PLACED

Chesterfield. — Sheffield Regional Hospital Board. Recommended. Electrical installation in nurses' home at the Royal Hospital, Chesterfield (£1,198).—N. R. Kirk & Co., Ltd.

Cumberland. — Newcastle-on-Tyne Regional Hospital Board. Electrical installation, Camerton Hospital, Cumberland (£1,548).—George Bowman, Ltd.

Hull.—Housing Committee. Electrical installations: Houses (112), Bilton Grange estate (Scheme 22AG) (£3,339).—J. Todd. Dwellings (90) (Scheme 22AH) (£2,447).—Booker & Tarran, Ltd.

London.—County Council. Electrical installation work, Monson County Primary School, Deptford.—F. Lawrence.

Newcastle - on - Tyne. — City Council. Lanterns and control gear for improved street lighting in Barrack Road, Newcastle (£1,140).—Metropolitan-Vickers Electrical Co., Ltd.

Ryton-on-Tyne.—U.D.C. Electrical installations in 16 houses on the Garden House estate, Crawcrook.—Storey & Crowe.

Seaham.—Urban District Council. Electrical work in connection with the erection of 42 houses on the Westlea estate.—J. Calvert.

WORK IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Aylesbury.—Burns unit at Stoke Mandeville Hospital; Oxford Regional Hospital Board, 43, Banbury Road, Oxford.

Barnsley.—Houses (150) at Athersley estate; borough engineer.

Birkenhead.—Extensions to factory, Grove Road, for Murray Morris & Co., Ltd.; R. & E. J. Eccles, architects, 7, Hamilton Square, Birkenhead.

Birmingham.—Shops (30), on sites at Kents Moat and Lea Hall, Tile Cross, King's Heath, West Heath and Rednal; H. J. Manzoni, city architect.
Reinstatement of fire damaged premises at Granville Street for Sherwoods, Ltd.; W. J. Webb, Ltd., Great King Street, Birmingham.

*Specifications may be inspected at the Commercial Relations and Exports Department, Board of Trade, Horse Guards Avenue, Whitehall, S.W.1 (Trafalgar 8855).

Border.—Houses (28) at Crosby-on-Eden, Burgh-by-Sands and Great Orton; R.D.C. surveyor, Victoria Place, Carlisle.

Brighton.—Sports stadium proposed at Speedwell (£144,500); city engineer, King's Road.

Buckhaven.—Secondary school for Fife C.C. (£250,000); R. S. Lawrie, County Chambers, St. Catherine Street, Cupar.

Cardiff.—Analytical laboratory in Croft Street; city surveyor, City Hall.

Chadderton.—Houses (252), Scholes Street, Stanley Road, Denton Lane and Arden Street; U.D.C. surveyor.

Choppington (N'land).—Pithead baths; National Coal Board, Ashton Towers, Gosforth, Newcastle.

Croydon.—Junior and infants' school, Castle Hill; Hugh MacIntosh & Partners, architects, 33, High Street.

Dover.—Flats (32), Durham Hill; borough engineer, Brook House.

Dukinfield.—Houses (96), Yew Tree Lane site; Cruikshank & Seward, architects, 16, Princess Street, Manchester.

East Kilbride.—Adaptations to form a bacon curing factory; Crowley, Russell & Co., Ltd., 16, Blythswood Square, Glasgow, C.2.

Falkirk.—Reconstruction and extension of premises for Gartshore & Sons, Ltd., Garrison Place, Vicar Street; Wilson & Wilson, 39, Vicar Street, Falkirk.

Gateshead.—Houses on 45 acres of land north of Leam Head, Felling, for the T.C.; H. J. Cook, chief architect, Municipal Buildings, Gateshead.

Brewery additions for J. Rowell & Son; Cackett, Burns, Dick & McKellar, architects, 21, Ellison Place, Newcastle-on-Tyne.

Glasgow.—Extension to factory at Edmiston Drive for Munro & Miller, Ltd.; Kelvin Construction Co., Lochburn Road, Glasgow, N.W.

Primary school at Rockfield Road for Glasgow Corporation; John McNabb, architect, 129, Bath Street, Glasgow.

Grimsby.—Houses (395), Grange estate; borough engineer.

Pumping station at Pyewipe (£227,325); Earth & General Contracts, Ltd., 4, Curzon Place, W.1.

Hemel Hempstead.—Pumphouse, workshops, etc., for new water pumping station; A. H. Turner, water engineer, Market Square.

Hove.—Extensions to coach building works; T. Harrington, Ltd., Old Shoreham Road.

Lancashire.—New schools (1953-54 programme): Worsley R.C. (£43,120), Whitefield Higher Lane Secondary Modern (£134,640), Middleton Bowlee County (£38,330), Middleton Bowlee R.C. Junior (£48,320), Middleton Bowlee Secondary Modern (£134,640), Prov'sden Little Moss Secondary Modern for Boys (£134,640) and Widnes Ditchfield Road County Infants (£37,750); county architect, Preston.

Liverpool.—New mission church at Kirkby estate; E. Kirby & Sons, Liverpool.

London.—Camberwell.—Boiler house at St. Giles' Hospital; R. T. James & Partners, consulting engineers, 6a, Lower Grosvenor Place, S.W.1.

Chelsea.—Block of maisonnettes, Cadogan Street; Guinness Trust, 11, St. James's Square, S.W.1.

Stepney.—Dwellings (80) and clubroom, Sidney Street; Sydney Clough, Son & Partners, architects, 39, Devonshire Street, W.1.

Louth.—Houses and flats (66) on the Eastfield Road estate; Vallance & Westwick, architects, White Hart Chambers, Mansfield.

Merton.—Flats (108), High Path Road; A. J. Thomas, architect, 31a, Sloane Street, S.W.19.

Newcastle-on-Tyne.—Extensions to factory, Gallowgate, for Scott & Turner, Ltd.; Cackett, Burns, Dick & McKellar, 21, Ellison Place, Newcastle.

Newcastle-under-Lyme.—New factory proposed at Apedale for Effra Sales & Service, Ltd.

Northumberland.—Grammar school at Killingworth; county architect, County Hall, Newcastle-on-Tyne.

Oldbury.—Shopping centre at Hurst Green Cakemore by J. Harper & Sons (Blackheath), Ltd.

Factory extensions at Ashes Road, Causeway Green, for N. J. Bradford, Ltd.

Oldham.—Adaptations at Blue Coat School; Thorpe & Whyman, architects, Oldham.

Roxburghshire.—Primary school at Burnfoot (£200,000) and extensions to High School, Hawick (£16,650); H. W. MacDonald, County Chambers, Newtown Street, Boswells.

St. Helens.—Power house, pumping station and offices, Parr Head Works; Sandford, Fawcett & Partners, consulting engineers, 53, Victoria Street, S.W.1.

St. Ives (Hunts).—Houses (58), Houghton Road; E. Price Lavender, architect, 17, The Broadway.

Sandy (Beds).—County secondary modern school (£61,000); S. C. Jury, county architect, Shire Hall, Bedford.

Scunthorpe.—Houses (78) and flats (36), New Brumby estate; borough architect.

Southend-on-Sea.—Scheme for over 500 houses, etc., on the Somerset Gardens site; borough architect, Municipal Buildings, Clarence Road.

Standish.—Houses (200), Baxter Street; U.D.C. surveyor.

Stourbridge.—Houses (447), flats (68) and bungalows (12), on the Pedmore Fields estate; G. N. Maynard, borough surveyor, Council House.

Torquay.—Dairy processing and distributive depot, Hele Road; Devonshire Dairies, Ltd., 60, Union Street.

Uxbridge.—Houses (126), Maygoods Farm site; H. E. G. Stripp, U.D.C. surveyor, 263, High Street.

Warwickshire.—Fire stations at Kineton, Bedworth, Shipston-on-Stour and Studley, brigade headquarters and fire station at Leamington Spa and extensions to Fire Station at Solihull; county architect, Warwick.

Washington (Co. Durham).—Houses (45) in Oxford Avenue; U.D.C. surveyor.

Whitley Bay.—Houses in Cauldwell Lane (14) and Hill Heads Road (20); U.D.C. surveyor.